ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXXXI. No. 3388. OCTOBER 30, 1942 6d. WEEKLY

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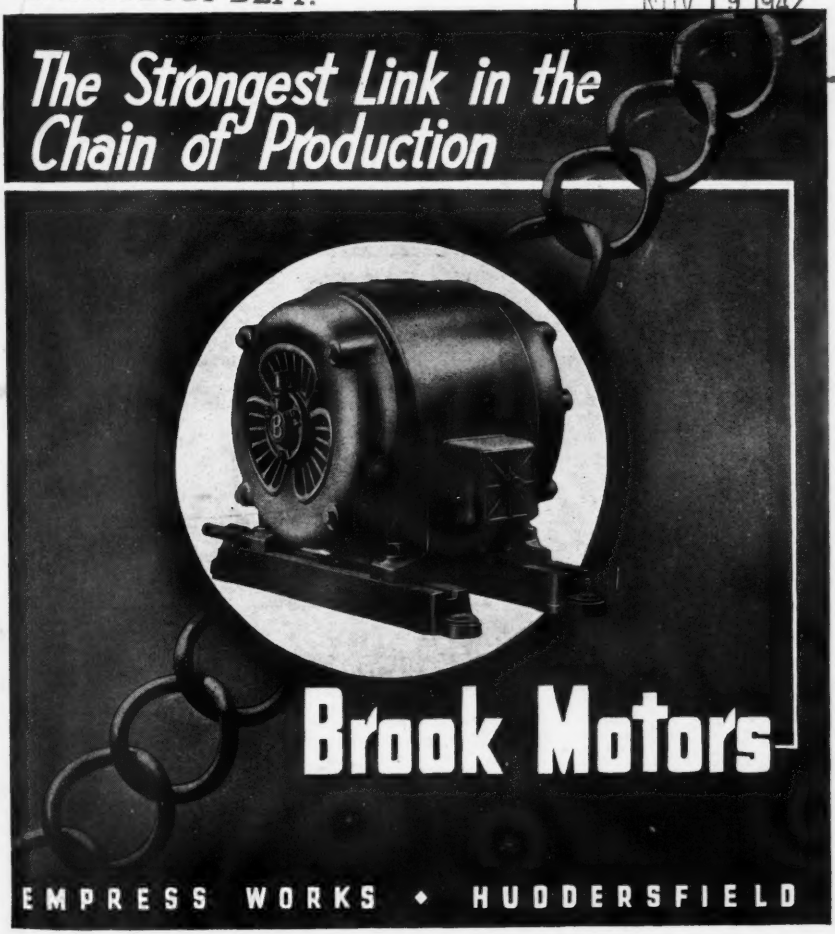

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Precision Gauged and Stamped Condenser Plates
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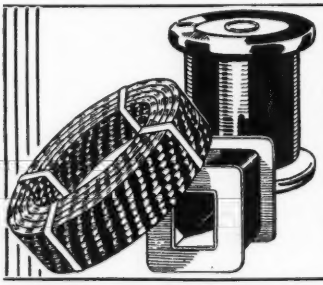

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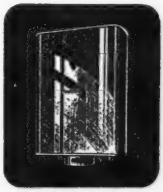
LOYALTY

Amongst all other human attributes we put Loyalty first—loyalty to one's friends (business or social), to one's faith, to one's Country.



And surely also, loyalty to the Electrical Cause in ceaseless striving to develop all that is best in Electrical Water Heating.

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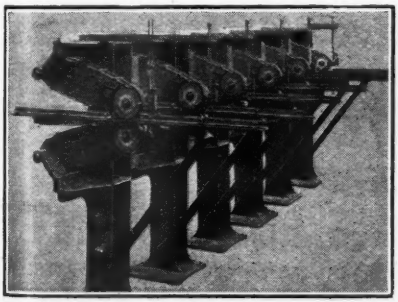

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For removing the scale from 2 surfaces on one edge of plate simultaneously, preparatory to welding. The grinding wheels are self-adjusting for varying thickness

A

SOUND TERMINAL WITHOUT SOLDER

Suitable for Telephone Lines

FOR CABLES AND WIRES OF ALL KINDS

SIZES FROM ¼" to ⅜" HOLE

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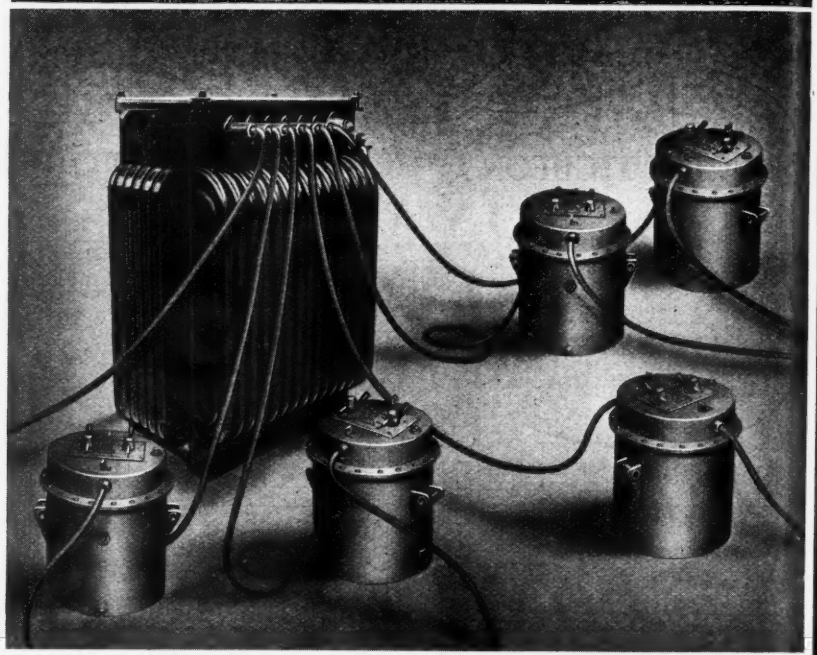

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These equipments will help you to increase your rate of production. They are designed for 3, 6, 9 or 12 operators at 300 amps. or for 3 or 6 operators at 600 amps. each.

Send for further particulars on this subject

The illustration shows the multi-operator A.C. equipment for six operators.

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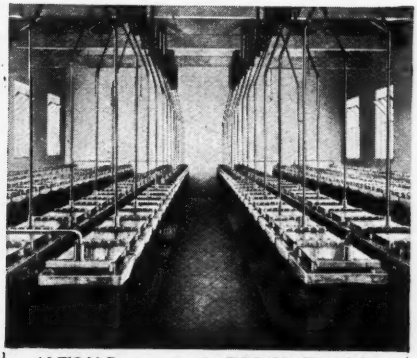
ALTON Batteries of Merit



ALTON Battery of 264 DLWII *Type Cells at a Corporation Electricity Works*

ACTION . . .

"Can do" is easily carried about.

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In matters relating to stationary batteries for all purposes, the Alton organization by virtue of its experience and competence is able to carry out all conceivable normal requirements. This applies, too, to replating—whether the original battery be of Alton or other manufacture. There are, in short, few stationary battery problems for which the Alton organization cannot provide a solution. If action is possible, then Alton "can do."

A4/41

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ALTON & FULLER BATTERIES
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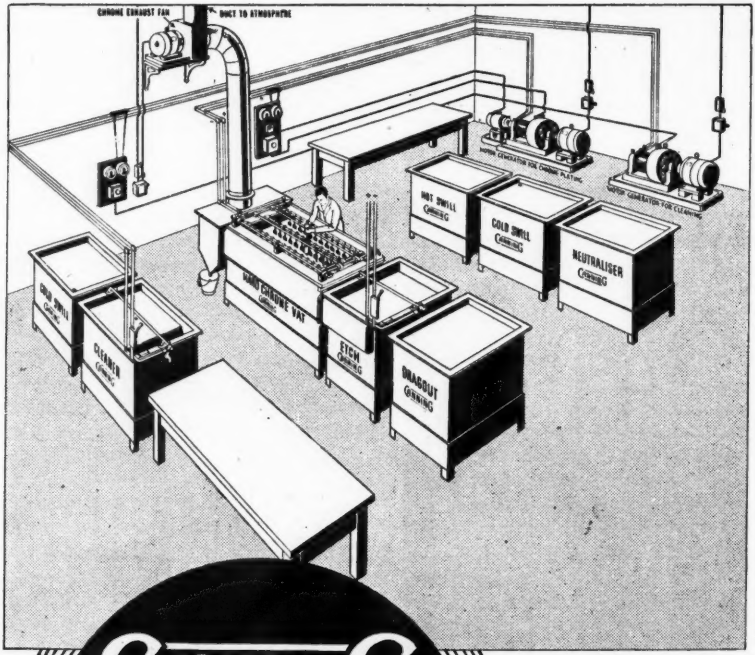

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CROWN HOUSE, ALDWYCH, LONDON, W.C.2

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AEI

NOV. 11
PLEASE GIVE GENEROUSLY
REMEMBRANCE DAY

FOR THE

ELECTRICAL INDUSTRY

WEFTLESS COTTON TAPES for cable identification, cable jointing, interleaving wires in transformers, electric motors, etc. Coloured tapes for cable harness in aircraft, tanks, etc. Numbered tapes for identifying cores in multiple cables, works maintenance, numbering machine tools, etc. Available in thicknesses ·005″, ·003″.

SLIT SEALED-EDGE EGYPTIAN COTTON TAPES for all insulation purposes, in widths from $\frac{1}{8}$″ to 3″, in white and colours. Printed Cloth tapes for cable leads in aircraft, parachute identification labels, etc.

A.I.D. Approval No. 2583/42

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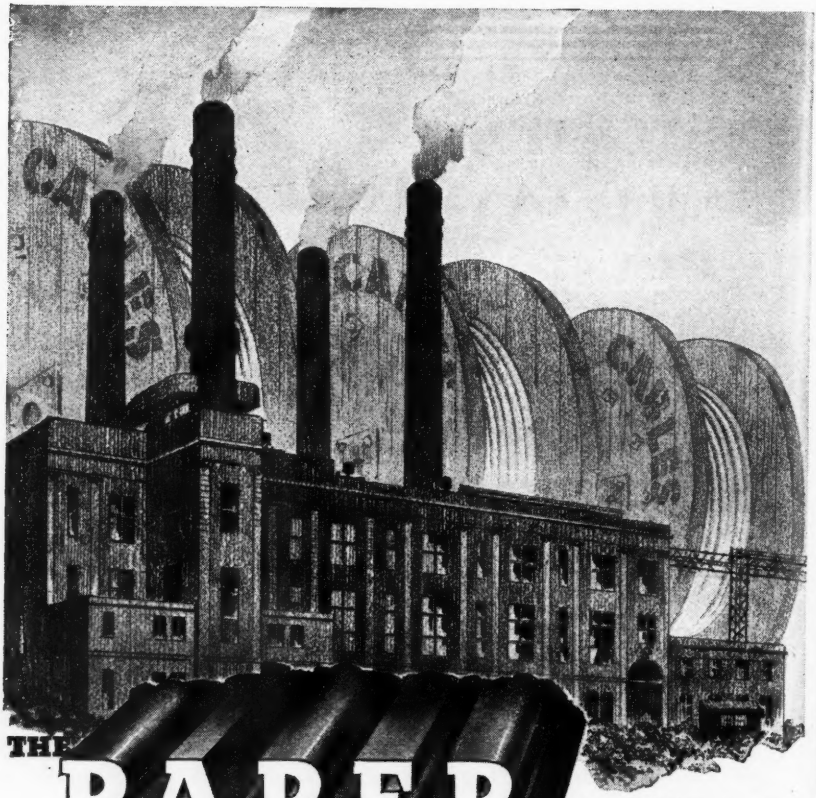
Among the many Air Conditioning Installations by Sturtevant are a number in the engineering industry. The above illustration shows the measuring room of one of the leading British gauge-making firms. This room, used for measuring work to tolerances of 0.0001 inch or finer, is kept at a constant temperature thermostatically controlled and maintained day and night and week-ends at 68°F. The air is delivered to the room dust-free and is also **ample for the ventilation requirements under black-out conditions.**

Sturtevant Air Conditioning in its many possible variations finds wide applications in all branches of industry—**particulars and some illustrations are given by our publication U1382.**

STURTEVANT ENGINEERING CO. LTD.
25. WORCESTER ROAD, SUTTON, SURREY.



THE
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ROTHMILL
CABLE INSULATING PAPER

The reliability of the generating plant is the same as that of its distributive cable. And the reliability of the cable is that of its insulation! That is why leading cable manufacturers use Tullis Russell Rothmill Cable Insulating Papers. Rothmill is renowned for its uniformly high quality, and is guaranteed free from metals and grit. A complete range is manufactured. Write for details.

Tullis Russell & Co. Ltd.

The Pioneers of Twin-wire Papers for Printers

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Protect pipes and pipe lines **now..**

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Not only domestic pipes—but water supply lines in industrial and commercial plants may become frozen with serious effects upon works production.

You can safeguard your installation against frost in an economical and simple manner

With **B.I. ROCKBESTOS BRAND HEATING CABLES**

(BRITISH PATENT Nº 543272)

B.I. Rockbestos brand Heating Cables also facilitate the flow—through pipe lines—of viscous liquids such as tar oils, whale oil, glucose, etc.

Write for Literature

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"The Girl in the Shop"

"The gentle touch that checks the windings."

This girl has been trained to perform some of the routine work of a test bay. Very rigid testing of all materials and finished products has been an important contributory factor in making the name FOSTER on transformers or switchgear a MARK OF RELIABILITY.

Transformers. All types and sizes up to 2,000 kVA.

Switchgear. AC and DC switchboards, including industrial ironclad.

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TRANSFORMERS & SWITCHGEAR LTD.
WIMBLEDON, LONDON S.W.19.

Manufacturers of Special Electrical Gear since 1903

FOSTER TRANSFORMERS & SWITCHGEAR LTD.
(INCORPORATING FOSTER ENGINEERING COMPANY) SOUTH WIMBLEDON LONDON S.W.19

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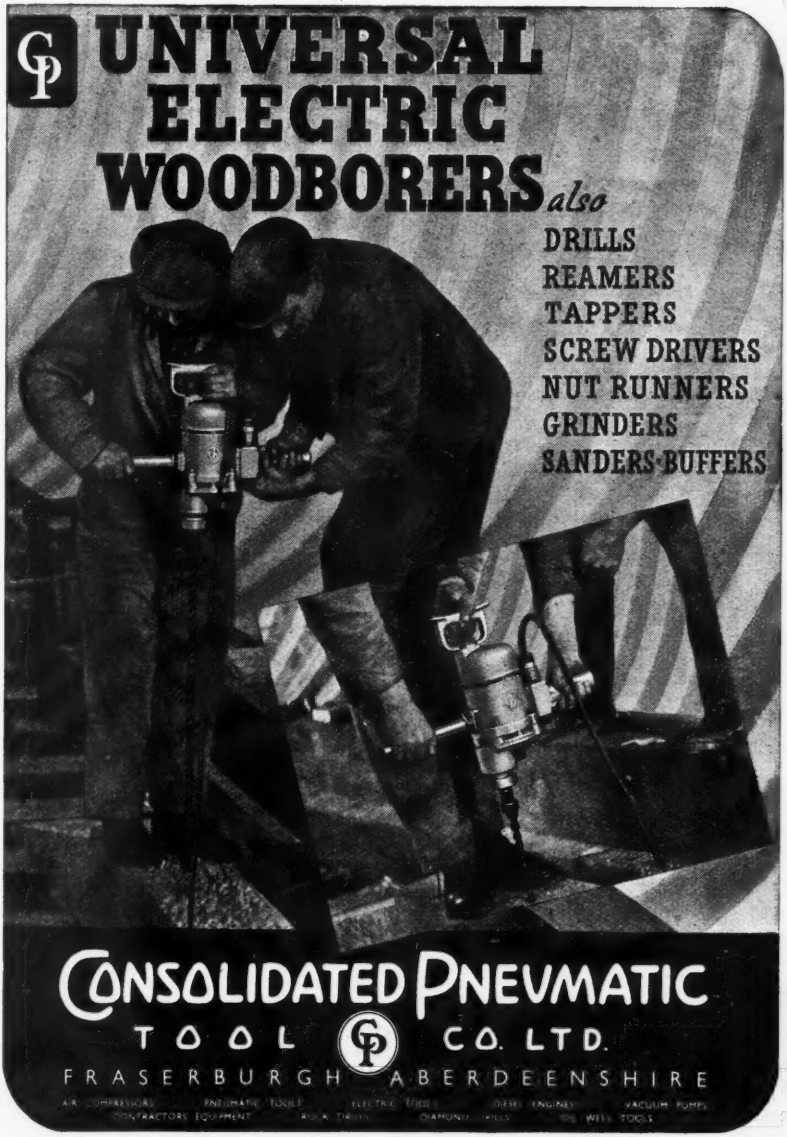
Associated Companies:— Lancashire Dynamo & Crypto Ltd., Manchester—Crypton Equipment Ltd., Willesden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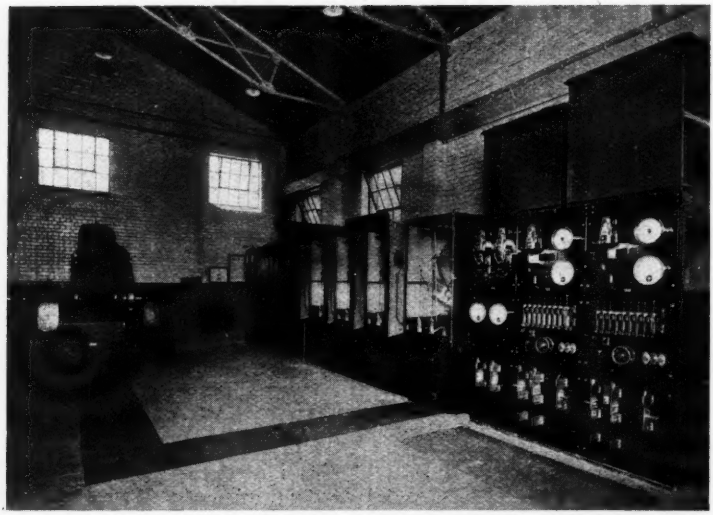
which excel in performance under the most stringent conditions



Photograph shows part of the wide range of ECC products and includes a four-bulb 480 volts Mercury-Arc Rectifier, ECC main D.C. control panel and a 500 b.h.p. variable-speed (150-350 r.p.m.) rolling mill motor.

THE ELECTRIC CONSTRUCTION CO. LTD.

WOLVERHAMPTON

Telephone 21455

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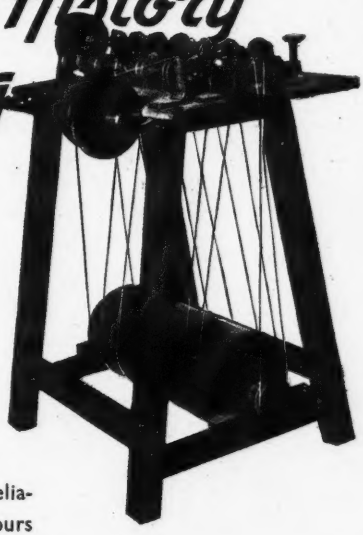
Cable-making History in the making



When William Thomas Henley commenced to manufacture insulated wires, over a hundred years ago, he probably was too engrossed with the task in hand to dream of the world-famous enterprise which he was founding. As he ingeniously designed and constructed his machines for covering wires with silk and cotton his aim was efficiency in production and reliability in the finished product. His endeavours and his ideals proved a firm foundation for future developments and in spite of set-backs and difficulties the name Henley now stands pre-eminent in the field of electric cable-making.

This machine made and used by W. T. Henley over a hundred years ago will still cover fine wires with silk and cotton with unimpaired efficiency.

HENLEY CABLES

Famous for over a Century.

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD.

MILTON COURT · WESTCOTT · DORKING · SURREY

PHONE: DORKING 5241 (10 LINES)
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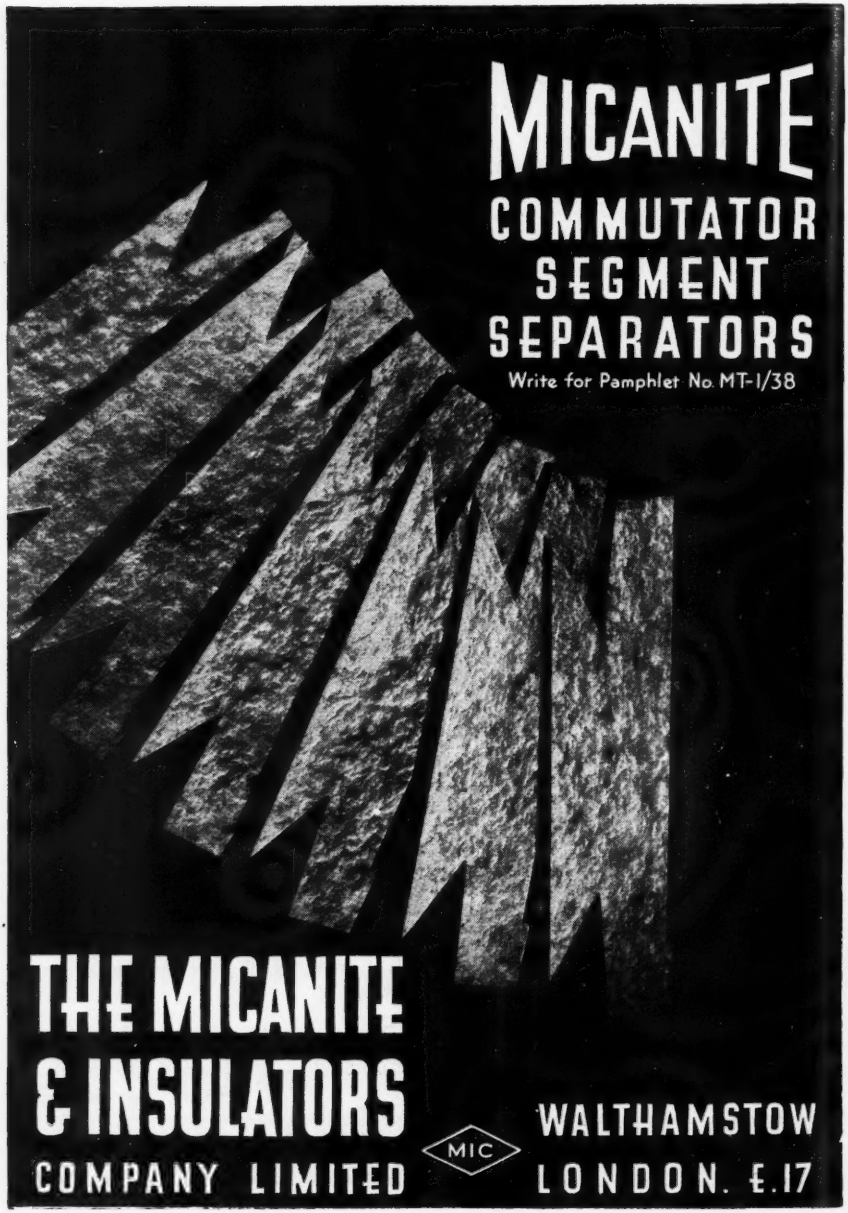
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THE MICANITE
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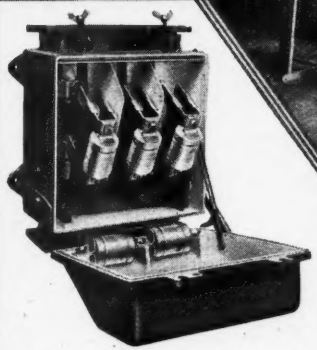
FUSEGEAR



300 AMP. T.P. "COMBINATION" FUSE-SWITCH SHOWING CARTRIDGES ISOLATED FROM BOTH LINE AND LOAD CONTACTS.

Specify

DOUBLE ISOLATION

and be Safe

All 'English Electric' 'Combination' Fuse-Switch Units from 30 amps. to 750 amps. possess this valuable double isolation feature allowing cartridges to be handled with complete safety when the switch cover is **open.** They are therefore suitable for the control of inter-connector and all other types of circuits on which a 'feed-back' can be obtained under normal or emergency conditions.

Write for full particulars.

THE ENGLISH ELECTRIC COMPANY LIMITED

— STAFFORD —

NOV. 11

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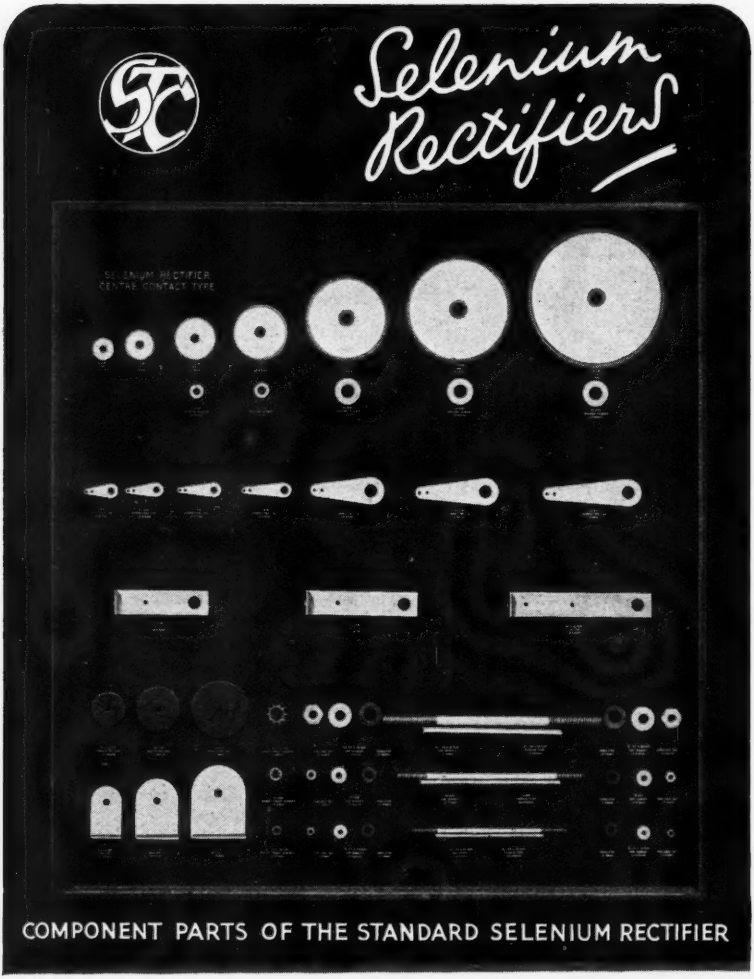
REMEMBRANCE DAY



COMPONENT PARTS OF THE STANDARD SELENIUM RECTIFIER

THE BEST IN SERVICE

Standard Telephones and Cables Limited
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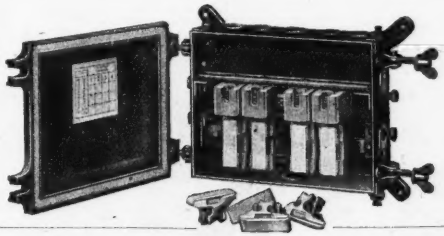
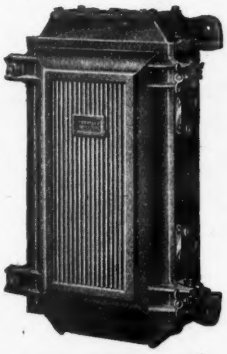
CRABTREE *Ironcased* FUSEBOARDS



The Crabtree "Pedigree" range of 10 and 15 Amp. (250-volt) ironcased fuseboards has been designed and produced with special regard to service conditions at home and overseas and is exceptionally strong in construction.

The fuse units are designed to "Home Office" requirements, the arrangement of the 'busbar allowing direct contact with the fuse contact blades—no 'busbar fixing screws being employed. This arrangement has made for compactness and efficiency. A distinctive feature is the provision of an all-steel body with hinged lugs and fixing feet of the same material—the latter being given additional strength by being spot-welded to the body portion. Lids are fitted with a packing gasket which makes all fuseboards quite weatherproof.



Exterior view of Crabtree 500-volt Fuseboard

Crabtree fuseboards are so designed that all normal wiring requirements can be effected quickly and neatly. Ample space is allowed for slack cable and the arrangements for swivelling the battens, illustrated above, permits a wide latitude of movement for easy access to fuse terminals. The facilities thus offered for easy wiring enable installation costs to be reduced to a minimum.

This advertisement does not imply that the products mentioned are necessarily available either in the United Kingdom or for export to any country overseas

CRABTREE

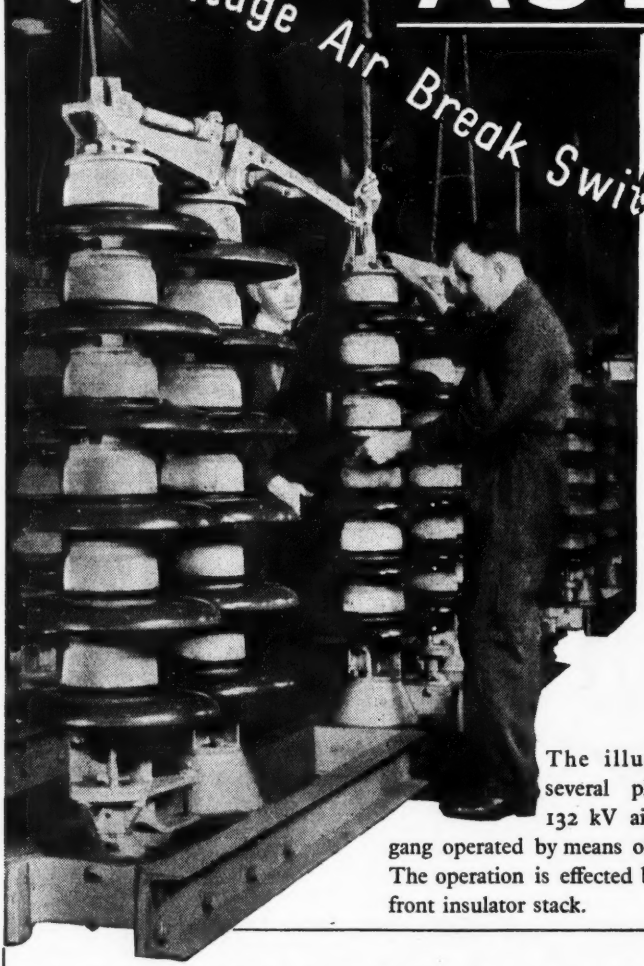
A · NAME · SYNONYMOUS · WITH · PROGRESS · IN · ACCESSORIES · AND · SWITCHGEAR

"Crabtree" (Registered) C554/148 *Advt. of J. A. Crabtree & Co. Ltd., Walsall, England*

A†

ASEA

High Voltage Air Break Switchgear



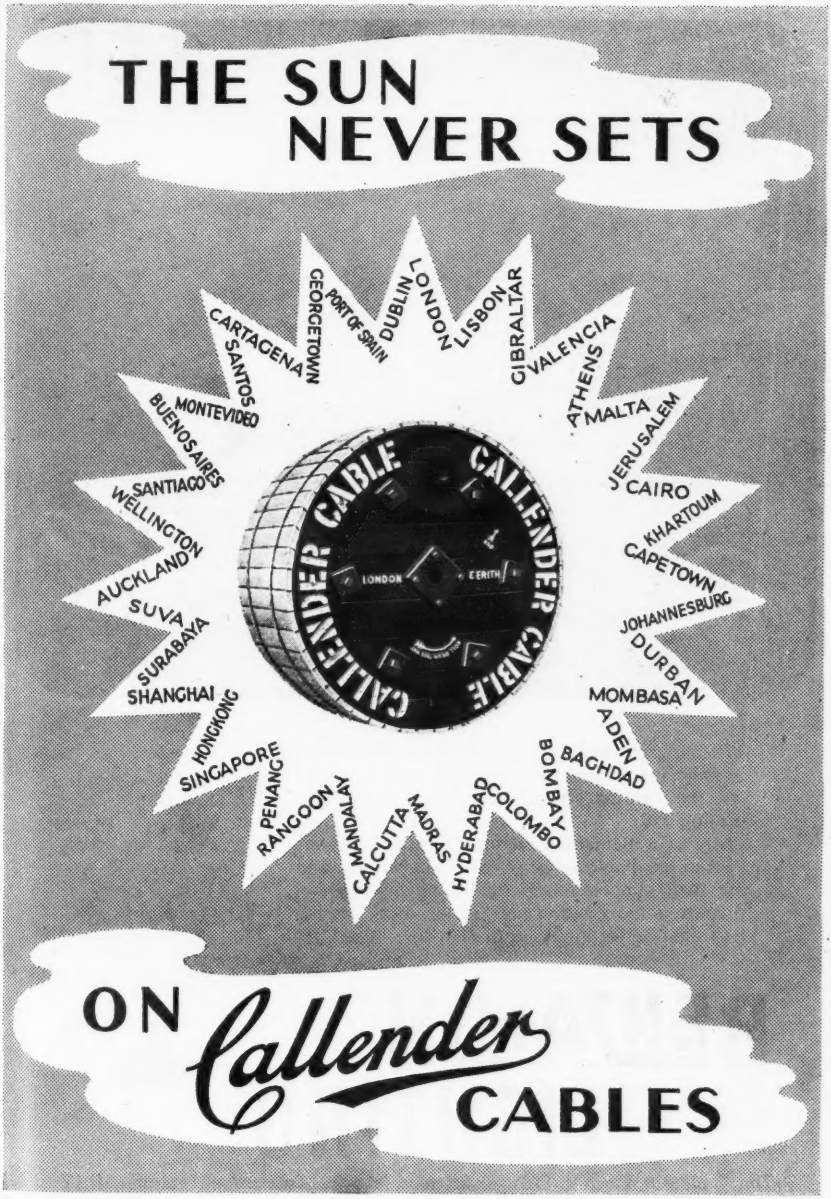
The illustration shows several phases of 3 pole 132 kV air-break isolators, gang operated by means of compressed air. The operation is effected by rotation of the front insulator stack.

ASEA ELECTRIC LIMITED

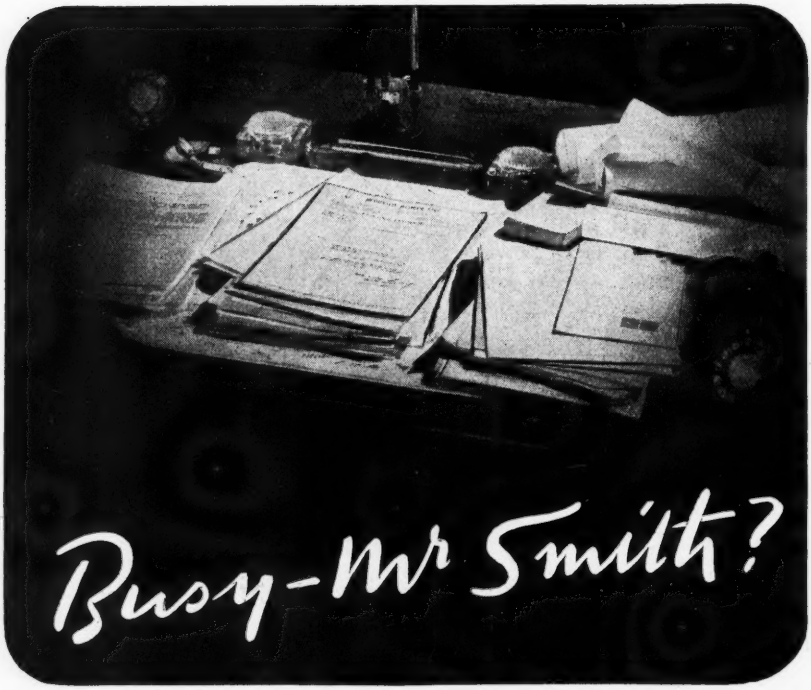
Associated with Fuller Electrical & Manufacturing Co. Ltd.

Head Office: FULBOURNE ROAD, WALTHAMSTOW, LONDON, E.17

TELEphone: Larkswood 2330 (10 lines). TELEgrams: Autosyncro, Telex, London



Callender's Cable & Construction Co. Ltd., Hamilton House, Victoria Embankment, E.C.4



That is where Benjamin can help you Mr. Smith by relieving you of all the detail work in laying out the lighting schemes for factories you are dealing with.
There is a Benjamin Engineer resident in your district, available to help you on any jobs, and the Benjamin organisation backing him up can prepare a specification and plans setting out the best lighting for any kind of factory.

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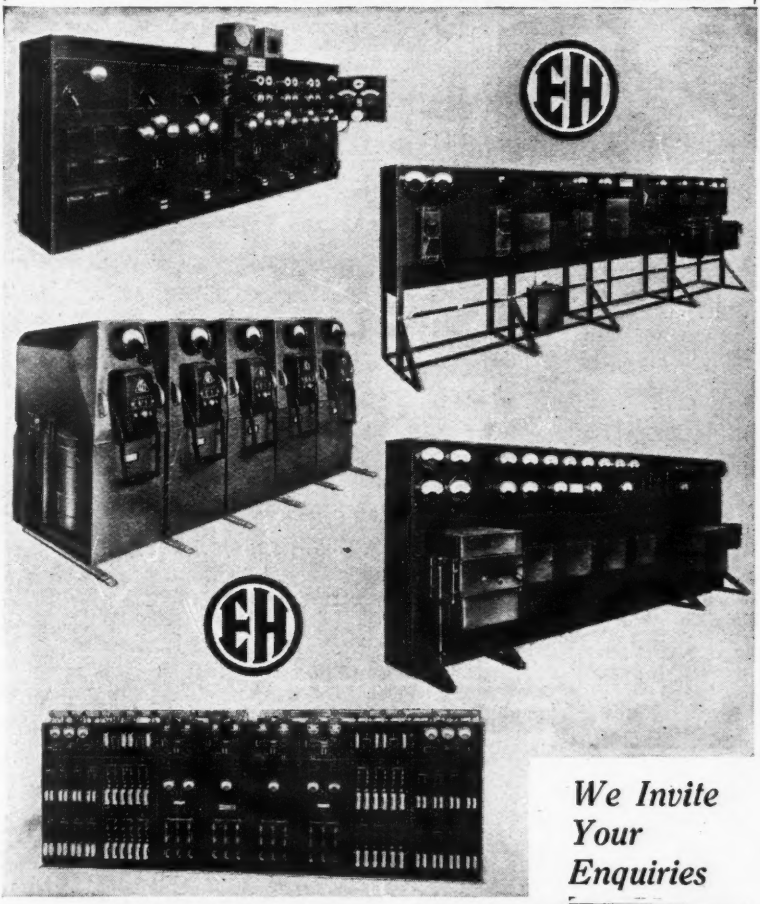
Specialists in

SWITCHGEAR *and* MOTOR CONTROL GEAR



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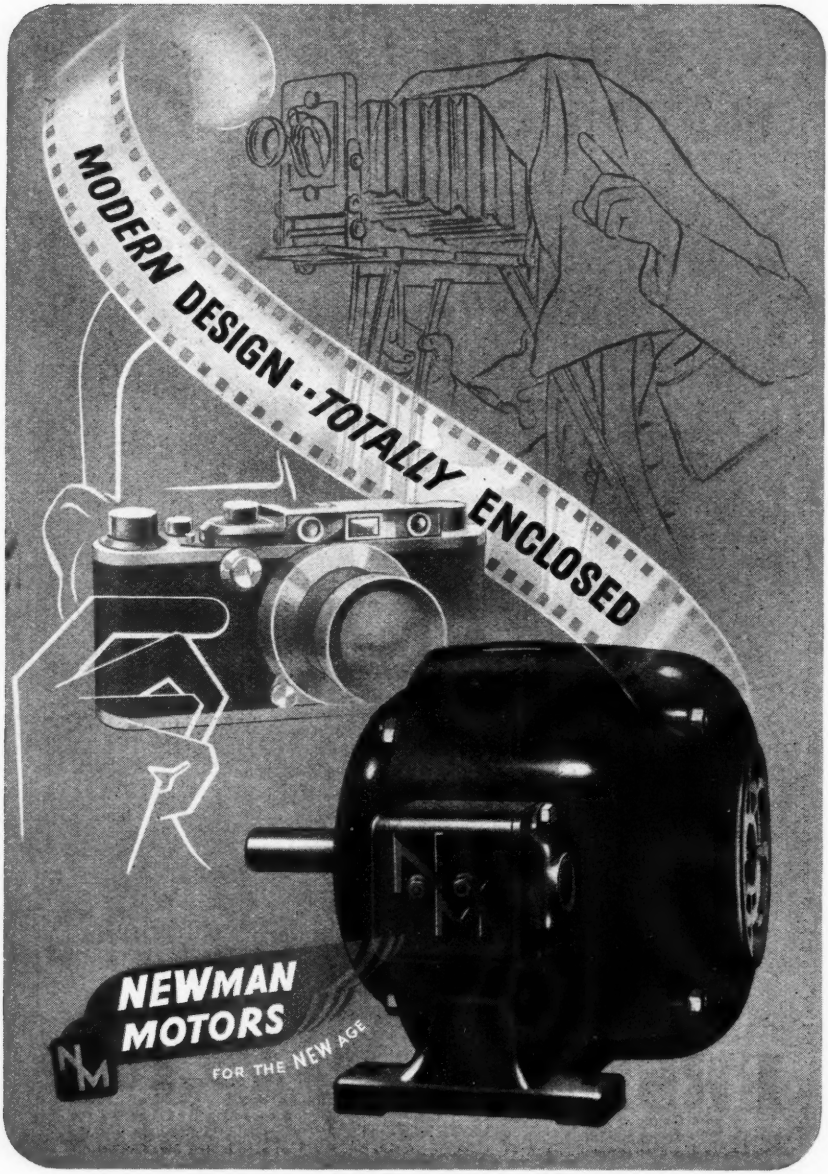

Head Sales Office: 32 VICTORIA ST., WESTMINSTER, LONDON, S.W.1 Tel. : Abbey 2023

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BMB

BIRMETALS LIMITED
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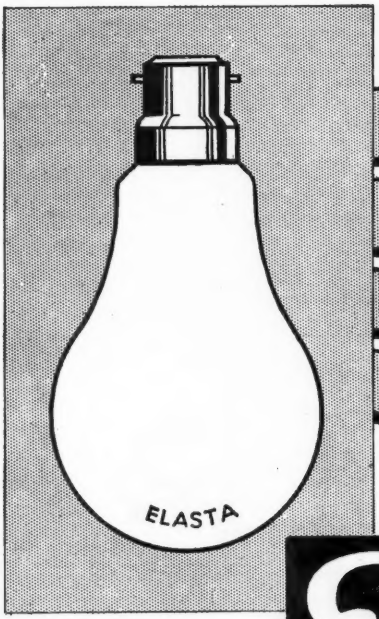

GOOD LIGHT ALL THE TIME

GOOD LIGHT ALL THE TIME because of the care in manufacture, and the quality of materials used. There is nothing "cheap" in ELASTA Lamps.

Elasta

ELECTRIC LAMPS

E.L.M.A. LAMPS MADE IN ENGLAND

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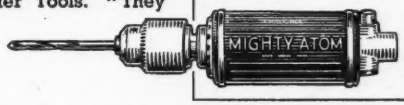

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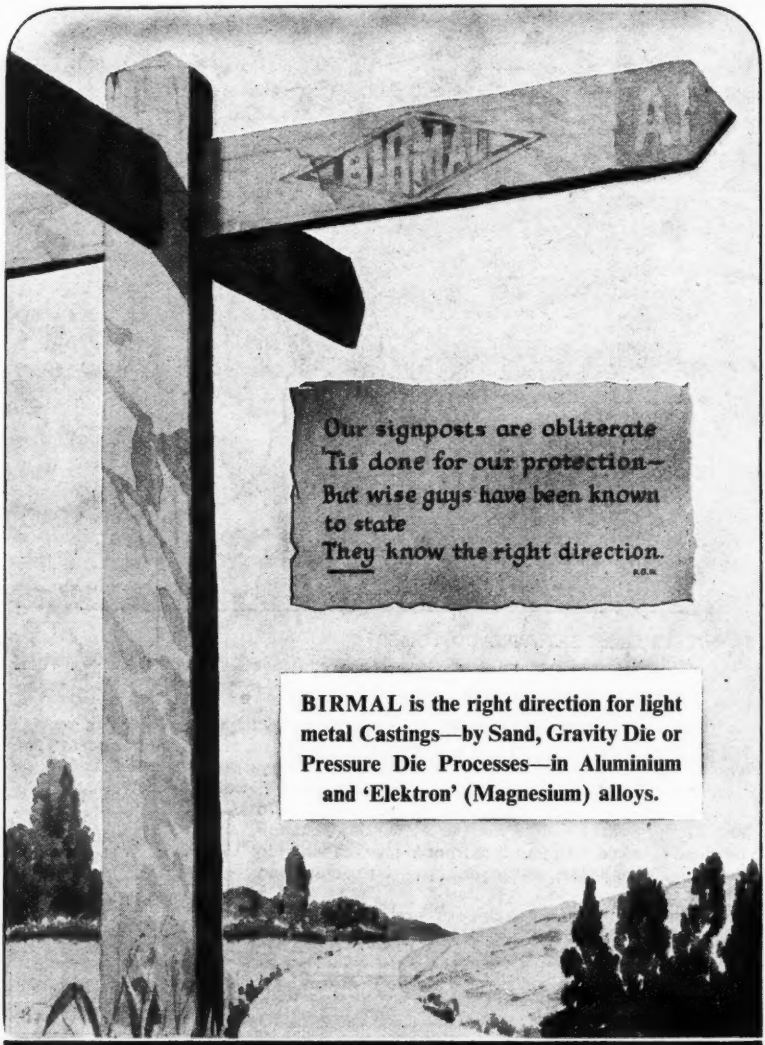
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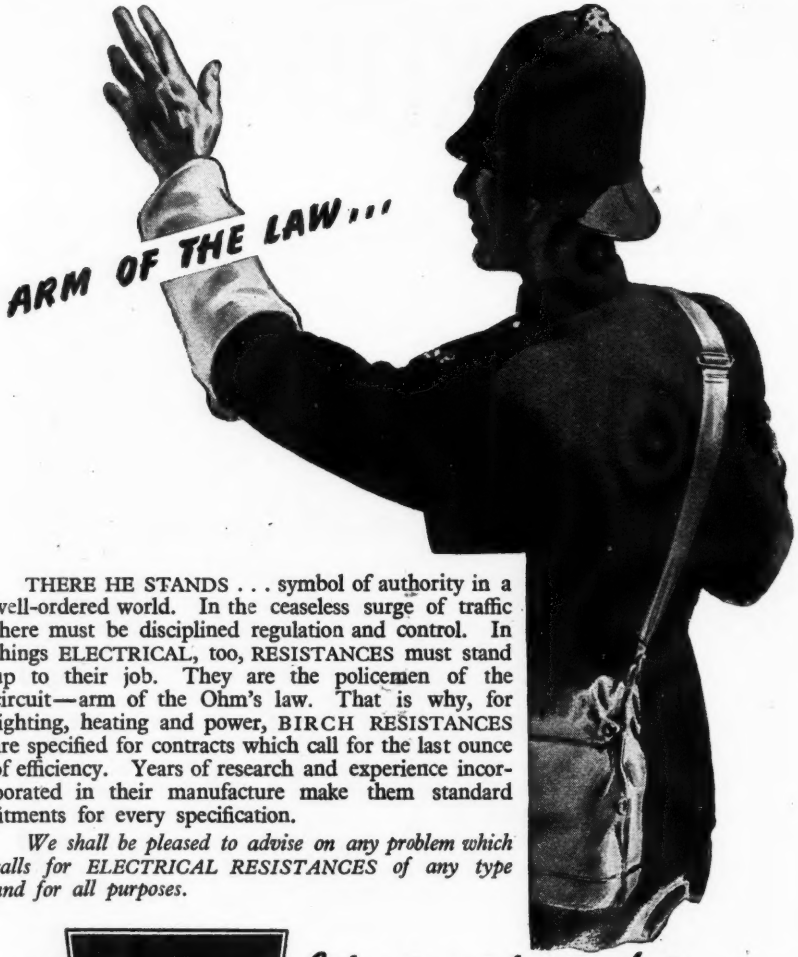

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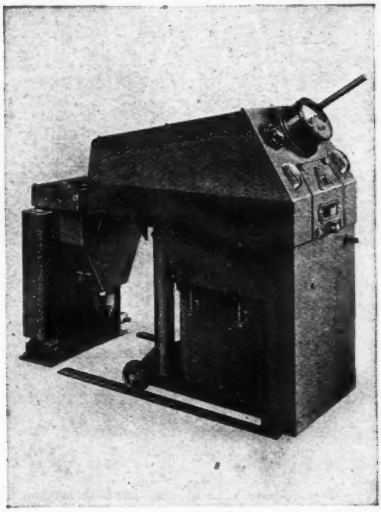

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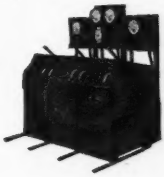

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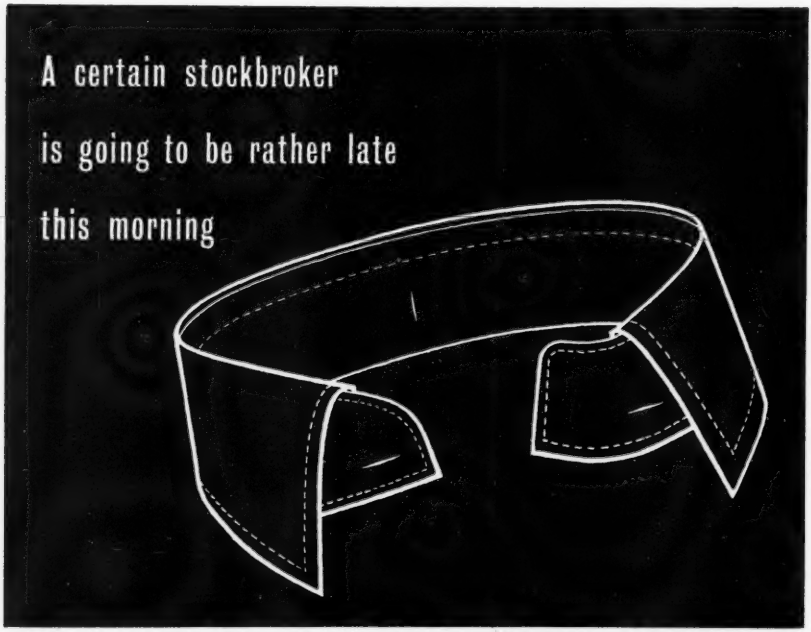

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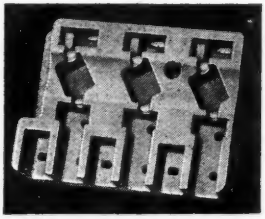

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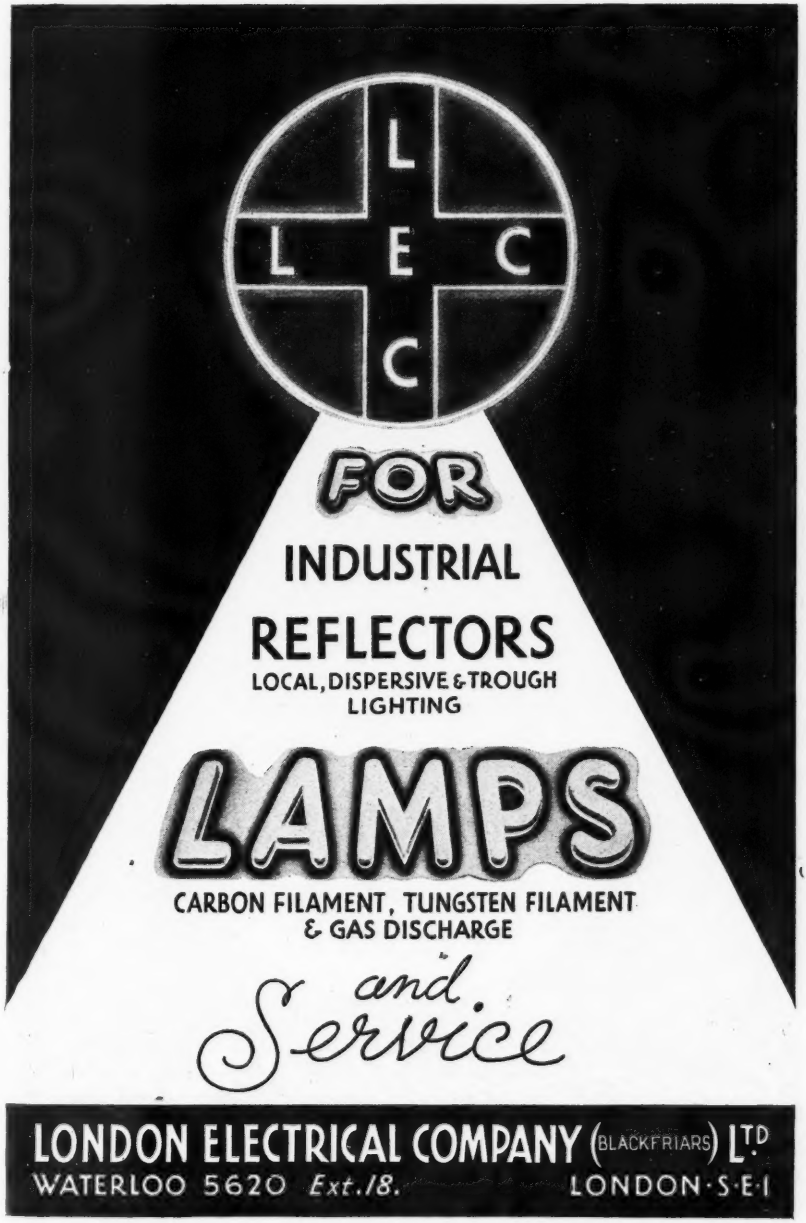
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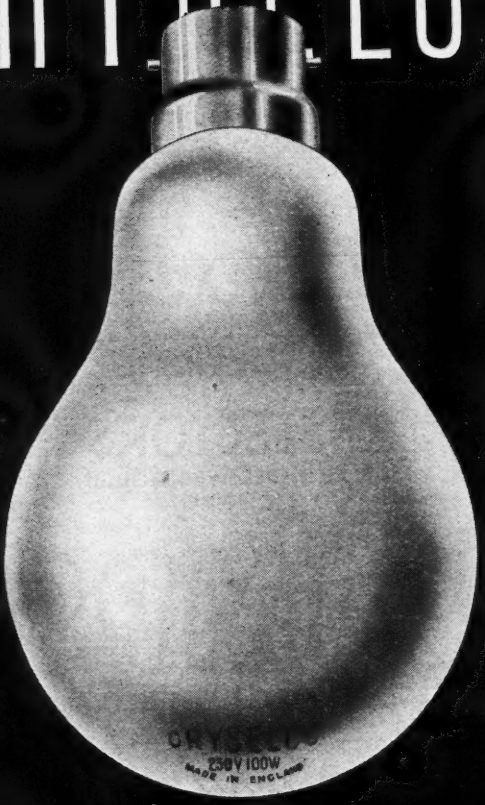

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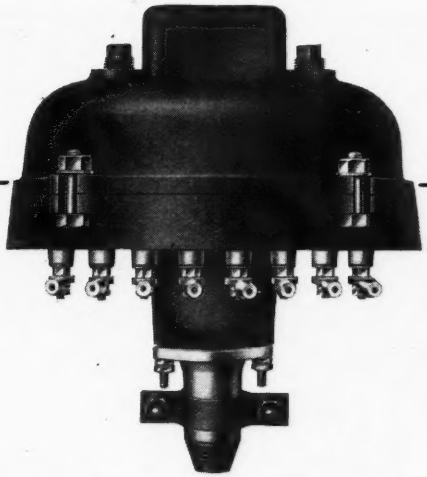

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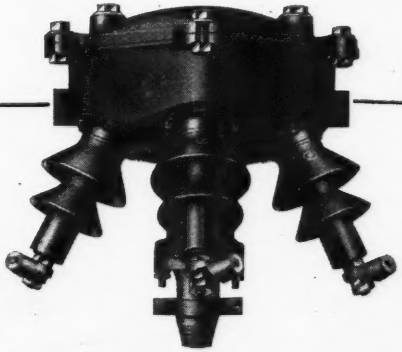

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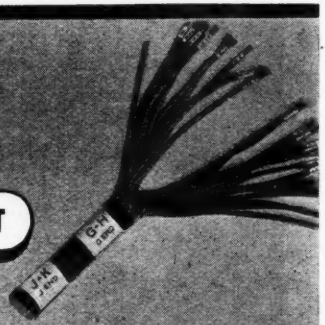

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ELECTRICAL REVIEW

Volume CXXXI — No. 3388

Friday, October 30, 1942

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EDITORIAL, ADVERTISING AND PUBLISHING OFFICES: Dorset House, Stamford Street, London, S.E.1.

Telegraphic Address: "Ageekay, Sedist, London." Code: ABC. Telephone No.: Waterloo 3333 (35 lines). Registered at G.P.O. as a Newspaper and Canadian Magazine rate of postage. Entered as Second Class Matter at the New York, U.S.A., Post Office.

Subscription Rates, Postage free: United Kingdom, £1 14s. 8d.; Canada, £1 12s. 6d.; Colonial and Foreign, £1 14s. 8d. per annum.

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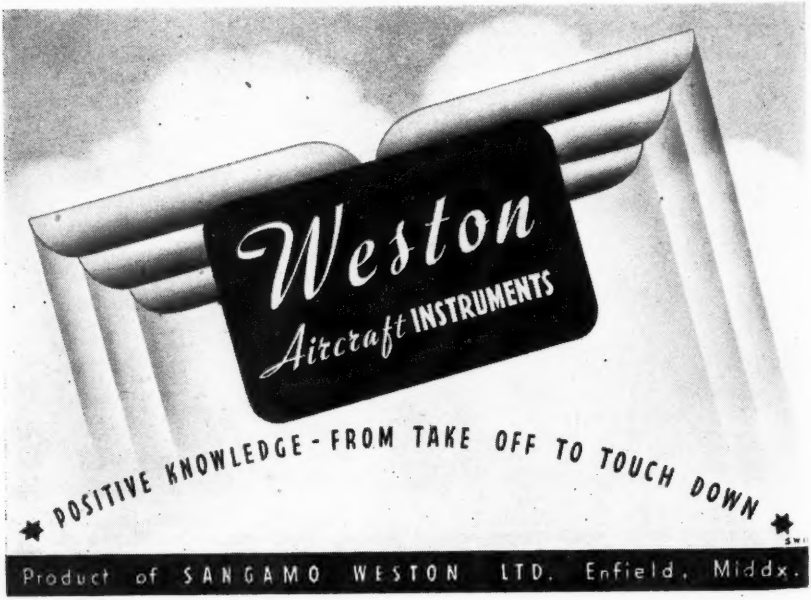
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Gas-Electric Competition

Wartime Needs and Peacetime Rights

WAR conditions necessitate making the most of what is available, but many may think that this is a good guiding principle at any time. Where there are two ways of meeting a requirement one of them may be thought superfluous, but which of them will depend largely upon the predilections or prejudices of the selector.

It may be argued that the strict economic standard is the one to be used in assessing the better way and in wartime there is something to be said for the argument. But austerity would deny to the people the benefits of civilised progress or, perhaps, some would prefer to say, the " trimmings " which, after all, go a long way towards making life tolerable. Guns must come before butter at present, but even Germans will not put up with a ballistic diet for ever. How much less then will our own people tolerate a perpetuation of practices which can only be justified in wartime !

Effects of the "Truce"

What has all this to do with the electrical industry ? The answer is—a great deal. The " standstill " arrangement between gas and electricity was probably very necessary, or even inevitable as appliances became scarcer and scarcer. But it would be stretching credulity too far to suggest that this necessity was a virtue to anybody but the gas people. The growing strength of electricity was being watched with alarm by its rivals, and the war provided a good opportunity of staying the advance in some directions (mainly domestic) although in others (mainly industrial) electricity's progress could not be stemmed.

In the Ministry of Fuel and Power the gas industry sees a powerful means of keeping electricity in its proper place—a place which the gas industry is to fix. We have no objection to the Ministry, even as a peacetime body, but we can see danger in it when it becomes the controller of warring interests which should be allowed to work out their own destinies. It has been very evident in the past few years that Government Departments are not the most progressive of establishments. In general they are against change, although they will countenance evolution—if it is not too rapid.

The Ministry's Functions

If there is to be a regulation of the fuel and power industries it is logical to entrust it to a single body as has now been done, but how far is regulation to go ? In our view the chief function of the Ministry is to see that sufficient coal is produced and that it is efficiently distributed. During the war it may be necessary for it to say that certain things must be done by gas and others by electricity, for in this, as in other matters, the public must be directed for the one purpose of winning the war. When victory is achieved the people must once again be allowed some choice in the ordering of their affairs—or what are we fighting for ?

It will be maintained that fuel economy is still imperative, but is this to be the only consideration ? Will the millions of

coal users be compelled to change over to gas or electricity because of their wasteful habits? And will the saving of coal by the use of gas instead of electricity for some purposes be sufficient to justify rigid demarcation? On a thermal basis alone the gas industry may be able to put up a good (though not holeproof) case, but the thermal basis is by no means the sole, or principal, consideration of the ordinary householder. Cleanliness, convenience, comfort, adaptability and other aspects come into the picture. The electrical industry may have to lie low at present, but let it be watchful.

Meter Standards

BECAUSE technical progress has been largely a result of diversity of ideas, uniformity in design is to be avoided until development has reached the stage at which any advantage to be derived from modification in detail is small in comparison with the expense and trouble it entails. We therefore agree with the plea put forward by Mr. E. H. Miller in his opening address to the I.E.E. Measurements Section for adherence to accepted standards in such matters as the size of terminal holes in meters. We also share his concern at any suggestion for the production of an identical meter by all manufacturers. At the present stage such a course would stifle the technical progress still necessary.

Boiler Deposits

MENTION was made of "water lancing" by Col. S. J. Thompson last week in his presidential address to the Institution of Mechanical Engineers. It will be remembered that Mr. R. J. Glinn also referred to the subject in his I.E.E. paper, on June 25th, on "Soot Blowers." Some particulars of the principles and development of the method in generating stations is given on another page. Experience of the process in operation indicates that it should in many cases materially aid the negotiation of the coming winter's peaks.

Too Many Representatives?

IN commenting on the report of the Scott Committee on Land Utilisation in Rural Areas we suggested that the Committee's recommendations for the reorganisation of electricity supply were superfluous as the matter had already been fully investigated by the McGowan Committee appointed for that particular purpose. The I.M.E.A. has expressed the same view and at the same time has protested against the way in which it and other electricity supply associations were ignored when the Committee was taking its evidence. The Committee might well reply that it had the views of the Electricity Commissioners and the Electrical Development Association. This raises another question: Is there any one body which can speak for the electricity supply industry? If not how can any committee of non-electrical men decide which of the several organisations which now exist is most likely to represent the common view?

Supervising Engineers

THE natural inability of non-technical managements in industry to assess the pecuniary worth of electrical engineers (apart from finding out the salary necessary to attract and retain good men) had led to many discrepancies and also heartburnings. The A.S.E.E. has evolved a method of obviating this anomaly, that of assessment by a man's technical peers, to which Mr. H. W. Swann referred in his presidential address to its members. The diploma of this well-established Association, backed by the opinion of leading electrical engineers, should be of considerable assistance to factory owners in securing economy and reliable service from their electrical installations through the engagement of expert supervisors at a suitable salary.

Superfluous Paper

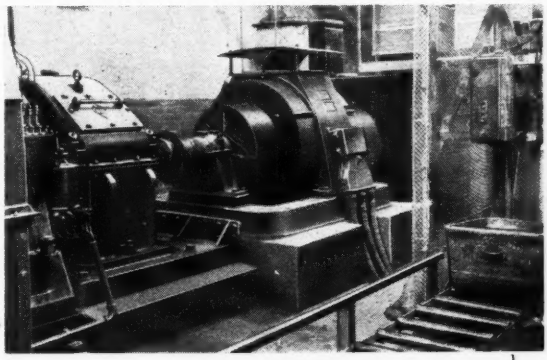
THERE has been a tendency to treat paper salvage as some sort of sacrifice when in fact it is nothing of the kind. On the contrary, people should be only too anxious to get rid of the masses of paper which accumulate in the course of business both public and personal. It is essential to keep records for a time, but not for all time. Peacetime standards were too rigid in many respects and their relaxation is now essential as well as desirable. The Electrical Industry Waste Paper Recovery Committee, 2, Savoy Hill, W.C.2, will be glad to assist in relieving firms and individuals of their unnecessary books, documents, etc., in pursuit of its aim of securing 5,000 tons of waste paper from the industry by the end of the year.

Tyre Manufacture

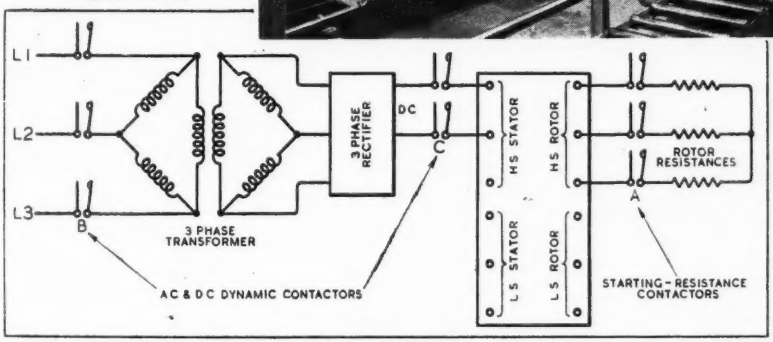
Selected Drives from a Large Rubber Mixing and Handling Installation

DURING a recent visit to a large automobile-tyre factory, we had the opportunity of obtaining some impressions of the advances that have been made in the electrical driving and control of various types of rubber and handling equipment, and while we have selected the following machines and plant sections mainly with the object of depicting such advances, we believe that the references will indicate generally the electrical applications to the particular industry.

Initial mixing and masticating of raw rubber is effected in Banbury equipments, the latest example of which is a machine driven by an English Electric two-speed, 1,000/500-RPM, 500/250-HP, three-phase, 440-V, slip-ring induction motor. This driving scheme is generally similar to that described in the *Electrical Review* of September 4th, 1942, except that dynamic braking is an added feature in this case. It is effected by injecting a DC supply from a metal rectifier into the high-speed stator windings at the appropriate time by means of an emergency-operated switch at the control platform on the machine. The arrangement may best be comprehended by reference to the accompanying diagram.



The latest Banbury mixer is driven by a two-speed 500/250-HP slip-ring induction motor with dynamic braking (see diagram below)



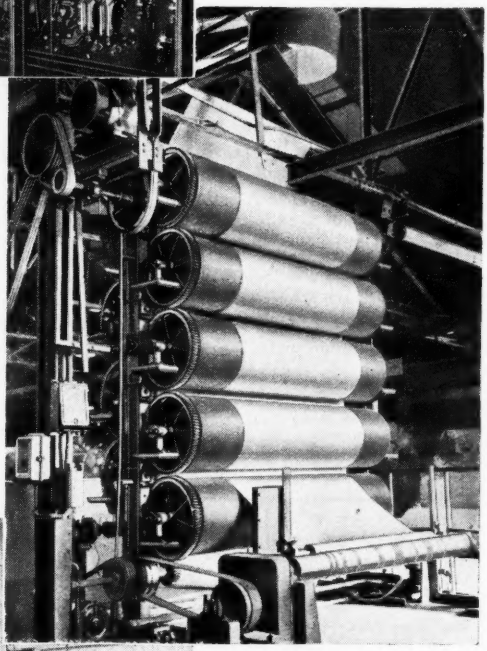
When the normal stop button control is pressed the motor is disconnected from the supply and comes to rest slowly of its own accord; but, when the emergency switch is tripped, the starter is disconnected from the supply, the high-speed slip-rings are connected to the starting resistance A and the t.p. dynamic contactor B connects the primary of a three-phase transformer to the supply. The secondary of this transformer feeds the metal rectifier surmounting the control cabinet (right) and the rectifier DC output breaker C is connected across two of the high-speed stator terminals. The motor then quickly and smoothly decelerates. An adjustable pneumatic timer opens the two dynamic contactors, etc., after three or four seconds, thus preventing the transformer and rectifier from being left energised inadvertently.

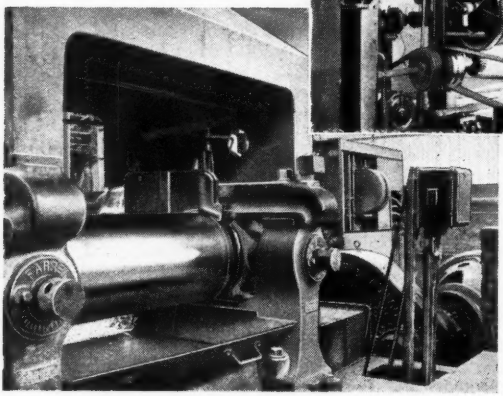
The major controls (Igranic) are housed in a double-compartment cabinet, the left

The major Banbury controls are arranged in a double-compartment cabinet

compartment containing seven rotor accelerating contactors, all of which are used when starting on the high-speed side, but only the last five when starting up on low speed. There are also two t.p. mechanically interlocked rotor contactors (left bottom) which connect either the high-speed or the low-speed slip-rings to the rotor starting resistance, depending upon which speed is required. One of the relays at the top of the panel is fitted with the adjustable pneumatic timer used in conjunction with the dynamic braking. The other compartment houses the high-speed and low-speed stator contactors (left), the low-speed reversing contactor (top, right) and the t.p. and d.p. dynamic contactors (bottom, right).

Various other mixing mills throughout the works for dealing with the material at different stages of production are arranged in lines, each on a common shaft driven by one motor. The drive selected for reference in this case is by a 300-HP synchronous induction motor which serves a line of four mixing mills. The motor runs at 600 RPM and it transmits through a magnetic

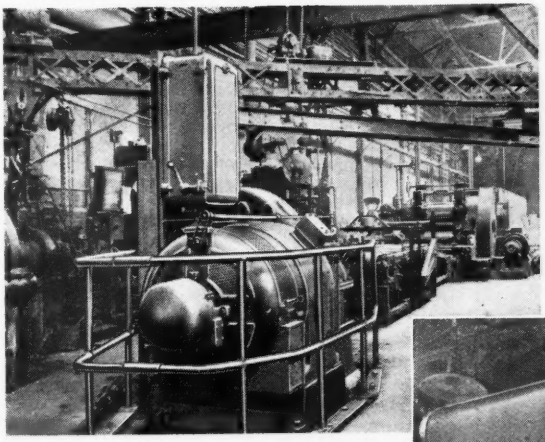




Above: This large drying calender is driven by a motor of only 2 HP. Left: A 300-HP synchronous induction motor serves a line of four mixing mills

clutch to a gearbox from which a speed of 92 RPM is imparted to the mill-line shaft.

The Igranic magnetic clutch is a safety stopping device consisting of a clutch mounted in combination with a magnetically operated band brake, the connections of which are so arranged



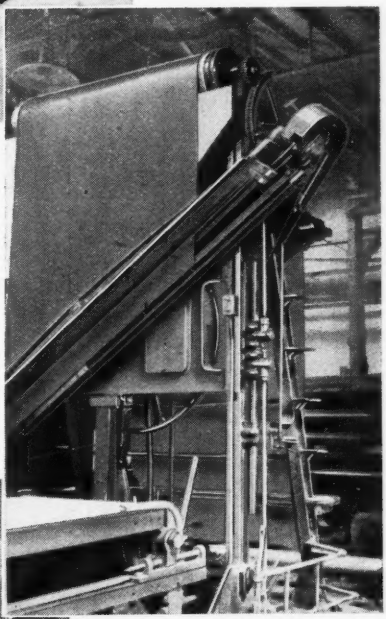
One tread-extruding worm is driven by a 100-HP, AC commutator motor

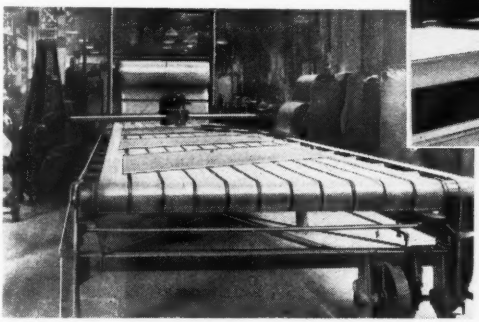
that the brake is released when the clutch is engaged. When the control switch is operated to disconnect the clutch brake from the supply, or in the event of the supply failing, the clutch releases and the brake engages. The brake is set by weights and released by the action of a magnetic solenoid. Since the clutch operates to disconnect the motor from the load the brake has only to overcome the momentum of the driven machine, which is rapidly brought to a standstill. Downward operation of an emergency cradle at the mill rolls actuates a switch which energises the solenoid. Current is supplied to the clutch winding by a pair of slip-rings to overcome connection difficulties.

The motor is auto-transformer started under the control of the frequency induced in the rotor. On starting up, the frequency is at first normal, but it soon reaches a neutral point at which the DC excitation is applied. The auto-transformer is relay-operated by means of a push-button.

Extrusion of mixed rubber to form the tyre tread is a particularly interesting operation and the extension lines embody some notable variable-speed driving schemes. In one case a 50-HP, DC motor operates the worm which pushes the rubber through the die. The speed range is 300/1,200 RPM and the transmission medium is gearing with a 10-to-1 reduction ratio. In another case the extruding worm is driven by a 100-HP, AC commutator motor with a speed range of 1,100/320 RPM and transmission is through a 22-to-1 reduction gear.

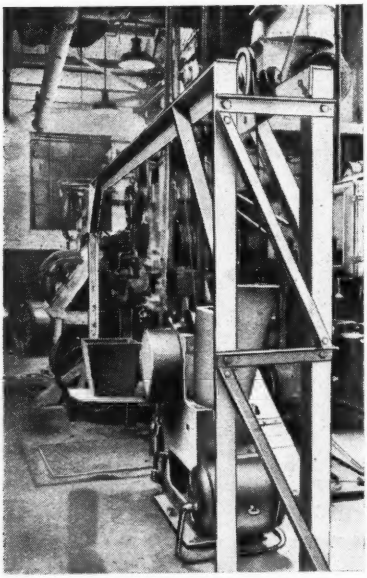
In each case the extruded tread is carried along lengthy motor-driven belt conveyors,





Each vertical bias cutter (above) is arranged in two sections, the feeding rolls at the back and the cutting machine proper at the front. The actual cutter of a horizontal equipment (left) is mounted on a carriage which is drawn across the table by a motor-driven chain

the speed of which is governed closely because of its influence on the thickness of the extruded material. It is driven by a 10-HP, DC motor (400/2,000 RPM) directly coupled to reduction gear with a 66-to-1 ratio, and also by a 1-HP, DC motor of similar speed but with a



On the bead-building machine one motor draws the wires, a second drives the extruder and a third the reeler

gearing of 50-to-1 ratio reduction. Variation of speed is obtained by shunt field regulation and the machines are controlled by push-button.

At the delivery end of the conveyor the tread is cut by means of a motor-driven cutter mounted on a cross-travel carriage which operates across the tread. Both the knife and the carriage are driven by the same motor. At a suitable point the end of the tread pushes against a trip switch arranged across the belt, and this stops the conveyor by means of a magnetically operated clutch. By suitable interlocking, the cross-cut motor on the carriage can be foot-switch operated only when the trip switch is "over."

The tread is one of what we may term the two main components of the tyre. The other, the carcass, is built up of rubber-impregnated fabric, the preparation of which involves some unusual drives. First, the fabric is dried on calenders. One of these which we inspected has ten steam-heated rolls, arranged vertically, but staggered, over which the canvas is passed. The stand is about 20 ft. high and it is difficult to believe at first that such a large machine can be driven by a 2-HP motor. This constant-speed, 950-RPM unit is floor mounted and transmission is first through a gearbox, then a short V-belt on to a pinion, and finally up the train of gears constituting the ends of the calender rolls which run at only a few RPM.

Another form of calender is used for impregnating the dried fabric with rubber which, in a sufficiently plastic state, is fed between the first and second rolls of one machine. The second roll carries it round to a third roll over which the fabric is passing. Different peripheral speeds of the second and third rolls results in the spreading of the rubber on to the cloth.

The motor is a 50/100-HP, 115/230-V, DC equipment. The normal speed at 115 V is 300 RPM and this is increased to 600 RPM by shunt field regulation. At 230 V the normal speed is 600 RPM, and this is increased similarly to 1,200 RPM. By this dual-voltage scheme the less expensive two-to-one speed range motor is used for an overall speed range of four-to-one. A heavy-duty, drum-type master switch which controls all the functions has a central "off" position, and when it is moved into the first notch in one direction it starts the motor with its field fully excited to run at 300 RPM. The handle may then be moved over 20 shunt field regulating notches to give speeds up to 600 RPM. This is all obtained with the armature and the series field on the 115-V supply. Moving the handles from the off position in the other direction gives similar control from 600 to 1,200 RPM at 230 V.

Field Control

A vibrating field relay ensures full field excitation during accelerating periods, while a change-over switch is provided to reverse the direction of the motor, if required. Field weakening is provided when the master switch is in the "off" position, so that the shunt field is partly energised and the motor accelerates more quickly when the master controller is moved, because of the appreciable time taken by the shunt field to build up from zero. The Igranic control equipment includes a main contactor, two voltage-selecting contactors, four accelerating contactors, a dynamic braking contactor and the necessary control relays. When switching off normally the dynamic circuit is closed, but in an emergency, when the safety switch is energised fully, some of the dynamic braking resistance is cut out, giving a very strong dynamic stop.

A supplementary drive on this impregnating calender raises or lowers the rolls to vary the thickness of the rubber on the fabric. The tyre body is built up of laminations of the impregnated fabric and, to increase the strength, the laminations are arranged with their weaving at different angles. To effect this the

impregnated material is cut into strips on the bias on either vertical or horizontal bias cutting machines. Each of the former is arranged in two sections. One section is a set of feeding rolls and the other is the cutting machine proper. Between the two sections the slack festoon is weighted by a roller which moves up and down in upright guides. A limit switch at the bottom switches the motor off when there is too much slack, and on again when the roller is lifted. An emergency switch at the top of the guides stops the cutter motor. The cutter is driven by a 3-HP, DC variable-speed motor with shunt-field regulation to give a speed range of 300 to 1,400 RPM. The motor drives, through a countershaft, a gear wheel on which an eccentric reciprocates a rod with a rack engaging a wheel on which is wound the cable that draws the cutter through guides arranged diagonally across the vertically suspended fabric. An extension of the gear-wheel shaft operates another crank arrangement which serves the feeder roll at the top.

Because of earlier troubles resulting from the very frequent starting and stopping of the motors on the vertical bias machines the normal starters have been replaced by heavy-duty equipments with "Cond I.T.L e" control, in which a condenser is connected across each accelerating contactor hold-out coil to increase the timing available, the timing being obtained by disconnecting the charged condenser and the coil from the supply and allowing the condenser to discharge through the coil, which has a comparatively high resistance. The starter has an interlocked isolating switch, shunt field regulator for adjusting the speed of the motor, two accelerators, a magnetic overload and a vibrating field relay to ensure full excitation during each starting period and acceleration to the speed determined by the position of the regulator.

In the case of a horizontal bias cutter the feed motor on the feeding roll is started up by a switch operated by the weighted festoon, and the material is cut across a table. The actual cutter is mounted on a carriage which is chain-drawn across the table by another motor. At the end of the travel the carriage bears on a plunger which, by means of a crank mechanism, puts the constant-running table feeder motor in and out of gear.

The tyre bands are built up on the collapsible drum of one of the tyre-building machines, on which the tread and the beads are also applied. At the sides the bank is worked to shape by a pair of rollers which are opened out from, and closed in to, the pulley sides by a small motor, but pressure is applied to the rollers by compressed air. The drum is driven by a 3½-HP variable-speed dual-voltage motor.

On a bead-building machine piano wires are heated and drawn through a die and a train of pulleys to the end of the line, and then back to a variable-diameter reeling pulley. At the die the wires are coated with rubber by extrusion. One motor draws the wire through the die, another drives the extruding worm and a third drives the reel.

Electric Hotbeds

Results of Experimental Work

SIMPLIFIED electrically heated hotbeds are the subject of an illustrated report by Messrs. C. A. Cameron Brown and E. W. Golding which describes in detail experiments carried out to determine whether the intensive production of early salad crops in small glazed frames, such as those used by amateurs, can be successfully undertaken.

The method consists essentially in equipping a garden frame with a soil-heating cable, or with bare iron wire that is loaded at from 2 to 5 W per sq. ft. by means of a step-down transformer. Such installations can be designed to operate on the domestic two-part tariff, the heating being so controlled from within the house which furnishes the supply of electricity that regular "doses" of heat are applied in each 24-hour period, varying from 40 to 45 watt-hours per sq. ft. per day according to district. The most convenient procedure is either all-night heating, or continuous operation at a lower loading.

The evidence from the experimental work, which is discussed fully together with seasonal cropping, is that the expected consumption for a 24 sq. ft. frame is 82 kWh in southern and 92 kWh in the northern areas, costing 5s. 2d. and 5s. 9d. respectively at 0·75d. per kWh, the installations being switched on in January and off at the end of March.

These consumption figures apply to cables and to transformers which are housed within the frame, since losses in the transformer will help in warming the frame; when the transformer is installed outside the frame the primary consumption must be increased by from 10 to 15 per cent.

The experiments have shown that the method described is a practical and economical way of growing lettuces of first-class quality from mid-March onwards with little attention and at a total cost, including overhead charges, well below the current retail prices in shops. While early lettuce is the main crop considered, others (such as carrots) can be raised simultaneously or in succession.

A special edition of the report (ref. W/T. 7) is obtainable at the reduced price of 1s. 4d., post free, from the British Electrical and Allied Industries Research Association, 15, Savoy Street, London, W.C.2, which will welcome comments from persons interested and particularly suggestions for co-operation from horticultural quarters.

Bulk-Supply Charges

Implications of the Scott Report

By N. Elliott,
M.A., A.M.Inst.C.E., M.I.E.E.
(Borough Electrical Engineer, Gravesend)

ELECTRICITY has a leading role to play in implementing the recommendations of the Scott Committee on Land Utilisation in Rural Areas. The Committee realised that electricity is not simply a form of energy competing with other forms of energy but that it is a unique force capable of raising existing standards of rural and urban life, that electricity is a mobile power and that it alone amongst the sources of energy can be used to change the present regional economic balance of the country. And so the Committee recommends "that electricity should be available in the home of practically every citizen in town and country alike at no higher price to the consumer in the country than in the town."

If this is to be achieved then it is imperative that the price of electricity sold in bulk should be the same to each and every distributing authority in the country. The present system under which the C.E.B. offers different grid tariffs in each of the seven grid-tariff areas into which the country is divided is out of date, and because the C.E.B. is exporting and importing large quantities of electricity *via* the grid lines from one tariff area to another, is manifestly unfair. Similarly the present system under which, in the same grid-tariff area, prices of electricity sold in bulk to the undertakings situated therein vary greatly and are largely dependent upon whether or not the undertaking has a selected generating station in its area is both out of date and unfair.

The author maintains that to realise the aim of the Scott Committee to provide electricity to rural consumers at similar prices to those charged in towns, the Central Board must charge the same flat rate to all its bulk-supply customers

The result of the present out-of-date and inequitable methods of assessing bulk supply charges is well illustrated by the following figures which show for 1938, the last year for which full records have been published, the price of electricity sold in bulk to 554 electricity supply undertakings (company and municipal) throughout the country:

No. of undertakings	Average cost of bulk supply per kWh purchased
10	Under 0·3d.
66	0·3d. but under 0·4d.
120	0·4d. but under 0·5d.
126	0·5d. but under 0·6d.
73	0·6d. but under 0·7d.
38	0·7d. but under 0·8d.
32	0·8d. but under 0·9d.
30	0·9d. but under 1d.
56	1d. but under 1·5d.
3	1·5d. and over.

Thus some undertakings were paying less than 0·3d. per kWh whilst others were paying more than 1·5d., a difference of several hundred per cent., a difference which has been widened rather than diminished by war conditions and the price increases under the coal clause.

If the whole body of consumers throughout the country are to receive the full benefits of the setting up of the Central Electricity Board and if the recommendations of the Scott Committee are to be implemented, then the Central Board must afford bulk supplies of electricity to all authorised distributing undertakings throughout the country at one and the same tariff at a point or points to be decided between the undertaking and the Board or, failing agreement, by the Electricity Commission. This being done, then all undertakings would receive bulk supplies at the same tariff.

But all undertakings must receive bulk supplies at the same price per kWh and so the tariff must either be a flat rate for each unit supplied or, if the two-part tariff system is to be continued, then each undertaking must have the same load factor. In the latter case a rationalisation of supply areas must be carried out, as is indeed recommended by the Scott Committee, but although rationalisation of supply areas is necessary it would probably be difficult to arrange that each area should have the same load factor and hence the most simple way of achieving the result desired is that the Central Board should charge for all bulk supplies at one and the same flat rate of charge which would of course incorporate a coal clause. The "Hopkinson doctrine" propounded in 1891 is not sacrosanct; as a method of charging for bulk supplies it has in the past been modified and is now out of date.

Such is the logical outcome of the Scott Committee's recommendations, as applied to bulk supplies, and such is the method of ensuring that the wholesale price (bulk-supply price) upon which the retail price to the ordinary consumer is based, shall be the same for each and every consumer as indeed in fairness it should be. The methods of charging individual ordinary consumers for electricity will not be changed, because the consumer himself controls the use to which he puts the supply, *i.e.*, he can control the

load and diversity factors of his supply which obviously affect the cost of the supply afforded to him.

In the past the electricity supply industry has attempted to be fair to each individual undertaking in relation to bulk supply charges. In the future the paramount consideration must be equitable treatment for each and every ordinary consumer of electricity, irrespective of whether the consumer is supplied by an undertaking operating a selected generating station or not. After all, all consumers pay, through the Central Electricity Board, the capital, maintenance and operation charges of all the selected stations and the grid system. The price clauses of the 1926 Electricity (Supply) Act must consequently be amended.

The Scott Committee has rightly criticised the organisation of the electricity supply industry and has recommended that "the Electricity Commissioners should be instructed to prepare a scheme for the reorganisation of electricity supply to consumers and to make a report for the consideration of the Government." The Committee has not similarly criticised the gas industry. Surely the electricity supply industry is not to be less well organised than the gas industry. It should, therefore, attempt to put its own house in order and not wait for this to be compulsorily forced upon it by the Government.

Slip Measurement

Useful Testing Methods

By C. G. Crampton

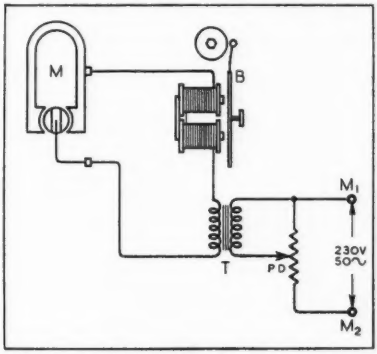
TO determine slip speed with any degree of accuracy from no-load to full-load a variety of methods are open to use, but most of these present considerable difficulty in application and some are of questionable accuracy.

The familiar method in which the rotor speed is checked by hand tachometer, the figure obtained being subtracted from synchronous speed, is liable to serious error. Mathematically the difference of two relatively large quantities to give a small result is not an ideal condition, more particularly if the accuracy of the tachometer be considered.

Most commercial tachometers, whether of the integrating or direct-reading type, will show a sufficiently high discrepancy to vitiate entirely results so obtained, although the error expressed as a percentage may not be of paramount importance in routine test work. Again, it may be desired to repeat the previous figures at the request of a visiting engineer or inspector, and this is seldom possible, more especially if the original instrument used is not available, thus arousing a distrust of the apparatus and figures in general.

The search coil and millivoltmeter are also of little assistance in the case of a squirrel-cage machine running on light load, the consequent low rotor current, and rotor flux, being practically impossible to detect. The same objections apply to the compass needle and stroboscopic methods, such as the electrically vibrated tuning fork and the stroboscopic disc, which are only of use at comparatively low slip speeds, becoming progressively difficult to estimate with increasing load. Dr. Drysdale's method which employs a rotating slotted disc, synchronously driven, would appear to be subject to the same disadvantages. Other methods to some extent dependent on accessibility or of a complicated nature, can be disregarded from the aspect of rapid production.

With these points in view, the following method was evolved and found to give accurate results from no-load to 200 RPM



Connection diagram of slip-frequency indicator
M, magneto. B, bell (or lamp). T, bell transformer. PD, potential divider. M_1 M_2, mains or motor supply terminals

slip and over. It has one disadvantage, however, that if used on a small machine it may, by reason of the power required, show false results. This could be overcome if an extremely high degree of accuracy were required. Slight further ingenuity could devise a method not requiring any torque,

while still employing the basic method of producing a beat frequency.

The first application was the mass-production testing of a large number of two-pole, three-phase, asynchronous machines. The procedure was to produce a beat frequency equal to that of slip by driving a small alternator having an equivalent number of poles to the machine under test. This alternator was conveniently coupled by an easily detachable flexible drive.

A suitable two-pole alternator was found in an old magneto, the primary winding of which was used as a source of supply by making connection to the framework and by pressing a brass spring brush on the central securing rocker screw. This AC was then superposed on the output voltage obtained from a small bell transformer having an adjustable output voltage, a condition for best operation being that the alternator voltage should be as nearly as possible equal to that of the transformer in order to produce zero voltage at phase incidence.

The resulting beat was then employed to operate a single-stroke bell. A lamp can be used, but it is easier to read the stop-watch using the bell method, thus leaving the eyes free for close observation of the watch ; also, sound registers more easily at higher speeds. The counting method was as follows :—

The stop-watch was pressed coincident with a beat of the gong, and the count commenced as 0, 1, 2, 3, etc., 0 being taken as the watch was pressed. At high speeds it was found advantageous to count always to 9 and then interpose the correct number, *i.e.*, 1, 2, . . .8, 9, 20, 1, 2. . .8, 9, 30, etc.

This beat is a wave having a frequency equal to the mean of the fundamental component frequencies with an amplitude variation frequency equal to the difference of the two component frequencies, these slower variations in amplitude being identical to those obtained when synchronising two alternators. Each beat obtained will, in the case of a two-pole machine, be a 2π gain of one vector over the other, *i.e.*, one pole pair, and therefore give an equivalent rotor speed of one revolution below synchronism. In the case of a machine possessing P poles this would become $\frac{2}{P}$ revolutions below synchronism.

The expression is then $N = \frac{120f - 2S}{P}$

where f = frequency of supply, P = number of poles, and S = number of beats per minute, N = revolutions per minute. It was expected that the EMF wave from the magneto would not be sinusoidal and this subsequently proved to be correct, but the interference caused was not in any way detrimental to the desired beat.

It has since been necessary to employ this method on four- and six-pole machines. In the latter case we possessed an electrical tachometer employing a small six-pole alternator which proved ideally suitable and the necessity for further improvisation was thus obviated.

It would, of course, be possible for some manufacturer to market a standard slip-frequency indicator, either employing a small variable-pole alternator using easily inserted permanent magnets or coils, or a similar electric tachometer having a variable speed gear drive. The latter could be easily done by the addition of a small gearbox to a standard electric tachometer, thereby making it a dual-purpose instrument.

Water Lancing

Increasing Boiler Availability

IN recent months attention has been drawn to the adverse effect of high-temperature external deposits on boiler availability. With a view to dealing with such deposits, particularly on superheaters, experiments have been carried out with " water lancing " with successful results.

Water lancing involves subjecting the slag of working boilers to repeated quenchings with cold water, which causes the most obdurate deposit to loosen and eventually to fall away. The process was developed at the Barking station of the County of London Electric Supply Co., Ltd., in conjunction with Babcock & Wilcox, Ltd. Here, boiler units of 256,000 lb. per hr. capacity had to be withdrawn from service, due to superheater fouling, after about 800 to 1,000 hours working.

Water lancing, as now practised, was begun on two boilers in October and November, 1939, and as a result the boilers steamed 15,953 hours and 16,076 hours up to August 31st, 1942, without any hand cleaning whatever and at rates considerably in excess of normal for long periods.

The Boiler Availability Committee, working in conjunction with the Central Electricity Board, has arranged for further installations, some of which will test the efficiency of the process on other types of boilers and superheaters.

Undertakings now using this process include the County of London Electric Supply Co., Ltd. (extension), the Lancashire Electric Power Co., the City of Bradford, Manchester Corporation, the London Power Co., the West Midlands Joint Electricity Authority, Leicester Corporation and the Kent Electric Power Co.

The equipment for water lancing is simple, and can for the most part be improvised by any station engineer with normal facilities. Boiler users are advised to get in touch with the makers of their boiler units for advice concerning the application of this process.

High-Voltage Plant

Maintenance Difficulties with Modern Designs

By J. H. M. Sykes

UNTIL recent years the maintenance engineer who had satisfied himself that the primary high-voltage connections to a section of the plant were isolated and earthed was able to commence work with his staff without further precaution. The gradual addition of remote relay panels, centralised indication arrangements, busbar-protection schemes and the like have made it necessary for him to spend some considerable time in isolating these secondary circuits as well, before the fitters can be assured that every connection to every one of the auxiliary switches is entirely safe.

The author makes a number of practical suggestions for facilitating the work of the plant maintenance engineer

He also has to contend with other difficulties. Making dead one switch in a substation with busbar protection of certain types may mean locking-off the busbar-protection trip circuits on other switches in the station, especially if it is of the "frame-leakage" type. A feeder equipped with interlock protection may be by-passed straight to a reserve busbar, and consequently the directional elements at the remote end may need to be put out of commission to avoid unstable operation on through faults. In some centralised indication schemes it is not sufficient simply to remove the fuses to the panel under maintenance, as this may either give an incorrect indication to the control engineer at the remote end, or may "lock up" the remote indicating apparatus and so cause other troubles.

Unless the fitters engaged in maintenance work can be absolutely assured that all small wiring is safe, there is a natural tendency for auxiliary switches and contactors to miss the thorough cleaning and overhaul which they need. The only way in which this can be achieved to the entire satisfaction of a staff who, though technically trained, are not specialists in protective gear and small wiring, is by having an isolating device either actually on, or immediately adjacent to, the switch or transformer on which work is being done. This device must be capable of being actuated by the maintenance personnel themselves, and must also provide, when operated, the required "dummy" indications for the indicating apparatus so that the control engineer is never misled.

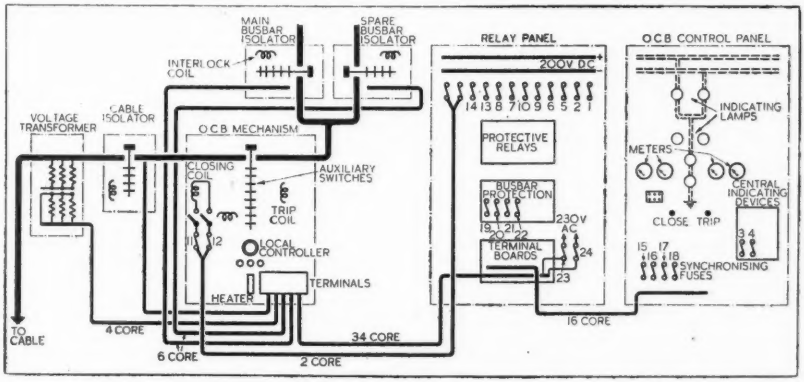


Fig. 1.—Typical circuit-breaker wiring layout showing position of fuses to be withdrawn to isolate mechanism

1, 2.—Indicating 200 V, DC. 3, 4.—Centralised indicating 50 V, DC. 5, 6.—Interlock 200 V, DC. 7, 8.—Tripping 200 V, DC. 9.—Hand tripping 200 V, DC. 10.—Closing 200 V, DC. 11, 12.—Heavy current closing circuit 200 V, DC. 13, 14.—Alarm 200 V, DC. 15, 16, 17, 18.—Synchronising 110 V, AC. 19, 20, 21, 22.—Bus zone busbar protection (busbar selectors 200 V, DC). 23, 24.—O.C.B. mechanism heater 230 V, AC

How this can be done is shown by reference first to fig. 1, which shows a small wiring layout for a high-voltage circuit-breaker with busbar isolators and a voltage transformer forming part of an outdoor double-

bus switching station. There is a local relay room, and the control is from an adjacent power station control room, with connections for centralised indication to the main load-dispatching centre. The 24 fuses, to be removed before the circuit-breaker mechanism is entirely isolated, are numbered.

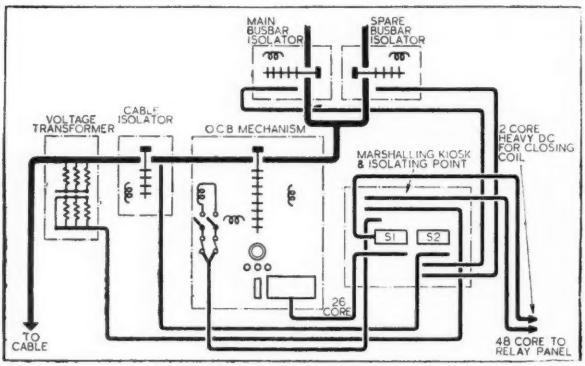


Fig. 2.—Circuit-breaker wiring layout with isolating switches in cable marshalling kiosk

S 1.—10-pole two-way isolating switch, with dummy indication circuits made in isolated position, for circuit-breaker wiring. S 2.—Similar switch for isolator mechanism boxes

In fig. 2, the left-hand portion of the same schematic layout is shown with an isolating device which consists of a knife switch which isolates the whole of the wiring to the O.C.B. mechanism proper and which also provides the correct dummy indications to give the remote control points their proper circuits, thus presenting the control engineer with an accurate picture.

It is installed in a marshalling kiosk, adjacent to the circuit-breaker. To this point, all isolator cables, etc., are brought, thus relieving the O.C.B. mechanism box of all wiring other than that strictly required for its own operation. The marshalling kiosk, having no movable contacts other than the knife switch itself, does not need any overhaul by the maintenance staff involving electrical circuits, and, moreover, presents the protective gear specialists with a convenient point for testing, disconnection, etc., without the necessity of making the whole circuit dead. An additional knife switch is provided to isolate the cables to the three isolator operating mechanisms for the necessary overhauls.

On smaller gear, of the metalclad or cubicle type, the same principle applies, but here the cable terminations are conveniently housed in a small wall-mounted junction box, adjacent to each circuit-breaker. The connection to the moving portion of each O.C.B. can then be made by leads encased in flexible tubes, which at once abolishes the uncertainty of multiple plug and socket contacts operated by the racking-in of the switch.

It provides also for the convenient testing of the switch while in the isolated position. The maintenance staff have the operation of the isolating knife-switches in the wall-mounted boxes near at hand and under their own control.

For a transformer, with its associated tap-changer, Buchholz protector, temperature alarms and cooling starting gear, the marshalling kiosk is again suggested, with clear divisions to indicate the isolation of the various portions, enabling the cooling, for instance, to be run and tested while the tap-changer is still under maintenance and *vice versa*. Too often this is not done, and all the multi-core connections from the various circuits are brought into the tap-change mechanism itself, with the result that any testing at all very likely needs the whole circuit out of commission. For a rapid and convenient check of the protection and alarms, push-buttons should be provided in the marshalling kiosk, clearly labelled, thus enabling non-specialist personnel to carry out a full test—short of actuating the devices themselves—at frequent intervals.

Alarm Systems

A further point which calls for attention in modern layouts concerns the alarm schemes. Very rarely does one find that in a given relay room or control room these are co-ordinated in any way. The transformer manufacturer provides a hooter for high temperature, cancelled by a tumbler switch leaving a red lamp alight, while the tap-change " operation-incomplete " alarm has a buzzer and a green lamp. The switchgear designer, whose panels are alongside, has another hooter, or a bell, for " switch tripped on fault," which leaves a white lamp, of a different pattern from the others, alight when cancelled by the operator. The various tripping operations by relay are indicated by flags of every possible size and location. Some show a red dot where an empty space in a relay nameplate existed before, and others give the exact reverse effect. The better type drop a flap which reveals wording

such as "Transformer tripped on earth fault," but all these, scattered over a large and complicated relay board, are difficult to check in time of stress. Moreover, the various hooters, buzzers, bells and lamps are highly confusing to the maintenance and operating staffs during testing operations.

The obvious solution is to centralise all alarms on an annunciator board. No great cost is involved in the provision of a small but robust 20- or 30-way annunciator panel, the function of which would be to light a red lamp behind wording like "No. 2 transformer h.v. switch tripped on overload," or "Buchholz gas alarm on No. 3 transformer." At the same time, a master buzzer of a penetrating but not too loud character would operate, and would be cancelled by a switch bringing into operation a bright lamp connected to a "flashing" device which would ensure its not being overlooked.

There is finally, the need for the provision of very clear and simple schematic diagrams, as opposed to wiring diagrams, of the whole of the plant comprising one unit. For instance, the high-voltage switch of one transformer circuit might be made by one manufacturer, the transformer by another, and the lower-voltage switch by a third. Each produces his own diagrams ; some are clear and include on one print all connections and all sources of auxiliary supply and so forth, but others are not at all clear. Too often, Messrs. Blank's transformer diagram, with, say, Buchholz trip circuits, shows two wires running off to the edge of the print, with the words "Buchholz tripping circuit—not supplied or run by Blank & Co." They label the two wires A and B, whereas Messrs. Dash, the switchgear people, have a numbering system, but the precise point at which the wires A and B enter their scheme is either nowhere shown at all, or else can only be found by consulting several diagrams and employing a certain amount of intelligent guesswork.

All this tends to make the maintenance engineer's path more thorny, and the obvious solution is to insist, when plant is commissioned, upon the provision as a matter of course of a full schematic diagram, co-ordinating all parts of the plant in one clearly defined unit, such as a generator with its high-voltage switch, auxiliary supplies and control gear, or a transformer with its higher- and lower-voltage switches, control and protective gear and tap-changer. These diagrams could be done by the consulting engineers, if such are retained, but sometimes the manufacturer with the largest amount of small wiring has agreed to incorporate the other makers' drawings in a set of co-ordinating master diagrams.

Allied to this is the need for a comprehensive system of labelling in such a manner that any engineer, coming fresh to the job would be unmistakably notified of the functions of the relays and other apparatus and would be in no doubt as to the correct method of isolating any part of the gear.

Electricity in Natal

Arduous Conditions on South Coast

IN a recent address on electrical development in Natal Major J. A. West spoke of the conditions in the Durban undertaking of the Electricity Supply Commission (which excludes the areas of the Durban Corporation and of other urban local authorities). The progress made, he said, had far outstripped the building capacity of the Congella power station, which, commissioned in 1930, was designed for a plant capacity of 60,000 kW but had had to be adapted to accommodate 98,000 kW of plant. Extensions now in progress provided for an addition of three 40,000-kW turbo-generators. It was not improbable that before many years had passed consideration would have to be given to the building of a new power station.

Although the Commission's ambitions for the Durban undertaking had not as yet been fully realised, steps had been taken to develop supplies of electricity on the Natal South Coast beyond the Durban Corporation's area of supply. As an indication of the advancement made he gave the maximum demands of the the Commission's system on the South Coast during recent years, as follows :—1937, 340 kW ; 1938, 432 kW ; 1939, 636 kW ; 1940, 1,179 kW and 1941, 1,350 kW.

The only feasible way of extending the transmission line down the South Coast was to utilise the railway administration's system, as the higher capital cost of a transmission line over an inland route would, owing to the nature of the country, have necessitated the application of tariffs which would have greatly limited development. The use of this route, which was on the sea front almost the whole way, had caused a great deal of anxiety and worry, and he believed the conditions were worse than anywhere else in the world. Many types of insulators had been tried, and although a measure of success had been achieved a single transmission line operating under such conditions was not a reliable means of supply.

The Electricity Supply Commission, like other suppliers of electricity, looked upon reliability of supply as most important and in view of development on the South Coast it had been decided to have a power station at Port Shepstone. This station was designed to accommodate three 700-kW Diesel sets ; two of these were on order and would have been commissioned this year had it not been for the war.

The Commission's power stations in Natal now consumed annually approximately 446,000 tons of coal. The Commission had powers to own its own collieries, and the time might not be very distant when consideration would be given to this question.

INSTITUTION PROCEEDINGS

Measurements Section Address. Engineers' Education.

Tariffs and Metering

IN his inaugural address as chairman of the Measurements Section of the INSTITUTION OF ELECTRICAL ENGINEERS, Mr. E. H. Miller (Sangamo-Weston, Ltd.) makes a number of suggestions with regard to the future. He feels sure that so far as integrating meters are concerned a great deal more co-operation will be needed between those concerned. While an industry is growing it is never easy to standardise, but surely the time has now arrived for a change of attitude. Specifications prepared with great trouble are too often made so wide as to form nothing more than a rough basis on which to work. All must agree ; there must not be any dissenting minority, so removing incentive to produce anything else.

He views with grave suspicion, however, the suggestion that standardisation should proceed to such an extent that all manufacturers will be making identical articles. Any make of meter should be capable of replacement by another of different make on the same base-board or panel, without re-drilling or "drawing" fixing holes and without disturbing connecting leads. But the construction of the meter proper must be left to individual manufacturers, otherwise initiative will be stiffled and there will be no development at all. Jewel bearings and pivots should not yet be specified, for instance, as the ball bearing has quite a number of enthusiastic protagonists.

Expensive Special Types

Tariff building involves new types of meters ; it is the duty and pleasure of the industry to make them, but, while they are technically interesting, the author doubts whether in many cases they are for the good of the community in general. Special types are more expensive than ordinary patterns and their cost finally appears in the price per kWh, which is a direct charge to the consumer. The smaller the latter may be the more complicated will be the meter required to deal with the particular tariff involved ; therefore the more complicated the meter is the less remunerative it will be. Servicing and maintenance considerations indicate that a ten-year interval (from the "appointed day") may be reasonable for most quarterly meters, but is far too long for prepayment meters with various auxiliary fitments.

The author believes the time has come for entire revision of the outlook on the tariff situation, aiming at simplicity and complete unification, without restriction of time or purpose for which electricity is used. He proposes a basic price for ordinary householders with discounts or rebates for large commercial purchasers, suggesting that if an edict were promulgated that the maximum basic price must not exceed 6·5d. per kWh, without any fixed charge, then amalgamations of distributing organisations would follow automatically. Necessary legislation might involve some form of control (perhaps a distributive C.E.B.), but not by any means complete nationalisation. Loan-raising easement, possibly even grants, to finance such a scheme will be worth while he considers, for he is certain that unification of tariffs will enormously increase the uses of electricity, thus stimulating post-war manufacture and trade.

Finally, in looking forward to the elimination of all but plain quarterly and prepayment meters, Mr. Miller asks one more unorthodox question, namely: Why is energy measured on a kWh instead of a kVAh basis ? He believes the former method has been fostered while the latter is ignored simply because of lack of demand for a satisfactory meter that is reasonably priced.

Training Methods

FACULTIES and aptitudes that make good engineers are discussed by Mr. H. W. Swann (H.M. Senior Electrical Inspector of Factories) in his presidential address (his fourth successive year) to the ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS in London.

Last year he referred at length to the technical training of works engineers and the scope of examinations. This year he points out that since attempts have been made to select candidates for apprenticeship on the basis of ascertained aptitude there has been a considerable improvement in average success. But if the tasks are too difficult workers will tire and become depressed, as will also the more intelligent types if they are given too simple routine jobs. They may be mastered with exceptional rapidity which, to the uninitiated employer, may be encouraging, but before long boredom will set in and efficiency will drop badly ; in fact, they will suffer from genuine fatigue as there is nothing so tiring as boredom. Failure to take proper account of these factors when apportioning work is no doubt one of the reasons why stereotyped employers sometimes find unusually intelligent and well-trained youths

disappointing, a fact which has led them wrongly to conclude that education is a disadvantage.

General education starts at home, is amplified at school and should be widened at the age when young people begin to think for themselves, about the time when technical education often begins. But Mr. Swann doubts whether education in technical institutions is on a sufficiently wide basis, for one has to learn to live as well as to learn to earn one's living. The tendency has been to direct all energy towards a very narrow economic goal.

Finally, Mr. Swann tries to relate his generalised remarks on ability and education to the particular objects of an association like the A.S.E.E., which does not attempt to force recognition of the merit of general membership without troubling about individual ability. Proper estimation of the latter, by technical judges who can not only assess members' qualifications, but also the technical requirements and market values of the jobs they hold, will lead to eventual all-round recognition of the place which electrical engineers occupy in the scheme of things.

Electricity in Mines

AT the first meeting of the session of the South Wales Branch of the ASSOCIATION OF MINING ELECTRICAL AND MECHANICAL ENGINEERS at Cardiff the branch president, Mr. H. J. Norton, who has held the office of honorary secretary for the past twenty-one years, delivered his address.

His subject was the Association generally and the South Wales branch in particular, and he referred to the rapid increase in membership, despite two major wars, from 424 in 1909 to 3,228 in 1942. The fact that all electrical plant at collieries must be tested, approved and certified surely indicated that the men responsible for the installation and maintenance of the apparatus and its safe working should be given a certificate approved by the Mines Department establishing their competency.

Mr. Norton felt sure that when normal conditions returned the Association's scheme of qualifications would be accepted as a substitute for State examination, and every electrician-in-charge appointed under General Regulation 131B would be required to hold a Grade I certificate, and any assistant electrician a Grade II certificate. To overcome a noticeable lack of knowledge among students of the requirements of the Mines Acts concerning electricity in mines, colliery companies should distribute among their electrical and mechanical staff copies of the regulations and the various Mines Department circulars issued from time to time.

He appealed to members to qualify and obtain the Association's appropriate certificate and be ready for the inevitable day when certification of colliery electricians and colliery mechanics would be recognised by Act of Parliament.

Mr. William Jones, South Wales Controller, Ministry of Fuel and Power, who attended to present the Association's gold medal and other awards, urged the Association and similar professional bodies to be ready when hostilities ceased to receive into their midst the many young men who would have gained a grounding of electrical knowledge in the Forces. Many of them would have sacrificed in the service of the country a vital period of their life which normally would have been devoted to apprenticeship. Mr. Jones then presented the gold medal to Mr. A. W. Kidd for his paper "Considerations Regarding the Layout of Colliery Electric Systems." For the same paper Mr. Kidd was also awarded the Association and the South Wales branch first prizes, value ten guineas.

This year's branch honorary secretary in succession to Mr. Norton, is Mr. J. Vaughan Harries.

The branch president, Mr. R. L. Wood, took the chair at a recent meeting of the Midland Branch of the Association at Mansfield when consideration was given to the report of the Committee on the amendment of the electricity regulations for mines.

Among those who took part in the discussion were Messrs. C. Hook, J. C. Laing and R. Walker. It was generally agreed that some of the recommendations of the Committee needed clarifying before any attempt was made to amend the regulations. Members considered that in this connection use might be made of an Association Committee which had been formed to deal with these matters with the Mines Department.

Engineering Training

THE choice of recruits for training as engineers is also dealt with in the inaugural address of Mr. W. Sutcliffe (Glasgow) as chairman of the Scottish Centre of the INSTITUTION OF ELECTRICAL ENGINEERS. Discrimination, he thinks, must be exercised in choosing recruits, whether for occupation in the lower or higher grades of the profession. Nobody can expect to become a successful engineer unless he is engineering-minded. That quality is an inborn capacity. Specialised training may encourage a feeble engineering instinct, but it is preferable that recruits shall be selected from young people naturally gifted with an engineering mentality.

Mr. Sutcliffe points out that it is sometimes said that engineers are indifferent to æsthetics in their designs. If this were true the engineer might well reply that short-

comings in this respect are the result of price competition. With a little care an engineer can present his finished product without sacrificing any artistic principles.

Productive Power

DELIVERING his presidential address in Glasgow on October 20th to members of the INSTITUTION OF ENGINEERS AND SHIPBUILDERS IN SCOTLAND, Mr. F. C. Stewart said the future wellbeing of humanity and also of engineering depended on the development of a sound national economy, one which recognised that the only reason for production was consumption. Since the beginning of the industrial era, engineers and technicians generally had given brilliant evidence of their power to provide the necessities, amenities and luxuries which the nations could enjoy. Unfortunately, the effect of that great productive power had been to create industrial and social problems faster than society could solve them.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, November 5th, 5.30 p.m. Joint meeting with the Institution of Mechanical Engineers to which members of the Institute of Fuel have also been invited. Paper : " Coal for Steam Raising," by Mr. J. N. Waite.

Wireless Section.—Wednesday, November 4th, 5.30 p.m. Paper : " A Study of Propagation over the Ultra-short-wave Radio Link between Guernsey and England on Wavelengths of 5 and 8 m. (37·5 and 60 Mc/s)," by Dr. R. L. Smith-Rose and Miss A. C. Stickland.

North Midland Centre.—Saturday, October 31st, 2.30 p.m. Great Northern Hotel, Wellington Street, Leeds. Paper : " The Electric Spark," by Mr. J. M. Meek, M.Eng.

South Midland Centre.—Monday, November 2nd, 6 p.m. James Watt Memorial Institute, Birmingham. Paper : " Coal for Steam Raising," by Mr. J. N. Waite. *Students' Section.* —Saturday, November 7th. Visit to Queen Elizabeth Hospital, Birmingham.

Western Centre.—Monday, November 2nd, 5 p.m. South Wales Institute of Engineers, Park Place, Cardiff. " Brains Trust."

Tees-side Sub-Centre.—Wednesday, November 4th. Address by Mr. H. W. Green, chairman of the North-Eastern Centre.

North-Western Centre.—Saturday, November 7th, 2.30 p.m. Engineers' Club, Albert Square, Manchester. Paper : " Telecommunications of the Future," by Dr. W. G. Radley.

North-Eastern Centre.—Monday, November 9th, 6.15 p.m. Neville Hall, Westgate Road, Newcastle-on-Tyne. Paper : " The Soot Blower," by Mr. R. J. Glinn. *Students' Section.* —Friday, November 6th. Old Assembly Rooms, Westgate Road, Newcastle-on-Tyne. Annual dance.

Northern Ireland Sub-Centre. — Tuesday, November 10th. Paper : " A Critical Review of Education and Training for Engineers," presented by Dr. E. B. Moullin on behalf of Post-War Planning Sub-committee No. 1.

Photo-Electric Signals

American Tunnel Scheme

LIGHT-OPERATED block signals for the protection of the forward and reverse traffic of men and materials, are being employed in the construction of a tunnel 13 miles long and costing £12,000,000, which is being drilled between Grand Lake and Estes Park, Colorado. It forms part of the Colorado-Big Thompson project of the United States Bureau of Reclamation and will carry water from the western slope of the Continental Divide to the eastern side, where it will be used for irrigation and the production of electric power. According to *Electrical Engineering* (the journal of the American Institute of Electrical Engineers), the trains in the tunnel travel on a 24-in. gauge single track with passing tracks at intervals. The signal system indicates to train crews the presence of a train in the next section, preventing accidents and reducing waiting time at passing tracks.

The accumulation of water and dirt around switches connected to the rails would impair the efficiency of ordinary signal systems and thus cause added expense and delay, while stray electric currents in the rails might cause premature ignition of blasting charges. So a signal system without mechanical or electrical switches connected to the rails was required.

The track is divided into blocks of about 6,000 ft., each block ending wherever a turnout occurs for passing. At the beginning and end of each block are two photo-electric relays, spaced about 20 ft. apart, which control the operation of red and green signal lights in that block. Each relay has two light sources located across the track and spaced about 15 ft. apart, so that only a locomotive or train can operate the lights.

All green lights are on when the track in a block is clear. When a train or locomotive enters the block and interrupts the light beams directed on the first relay, there is no reaction, since this relay controls the green lights already in operation. When the light beams directed on the second relay are broken, the green lights are extinguished and the red lights are switched on.

Cape Town Notes

THE following notes are taken from the *South African Engineer and Electrical Review*, the official organ of the Association of Municipal Electricity Undertakings of South Africa and Rhodesia :—

The Electricity Committee of the Cape Town Municipality has recommended the Council to place orders with British Insulated Cables, Ltd., for supplies to a total value of £50,435.

In its latest report the Committee also makes reference to the serious breakdown that occurred on the main switchgear at the Salt River power station in October, 1939. As a result of this it was decided to make a complete rearrangement of the switchgear so that any anticipated conditions in the next ten years could be met. This meant the provision of additional tie feeders between the power stations at Salt River and Table Bay. The tie feeders at present follow the route of the Esplanade and the Marine Drive to the bridge over the Salt River mouth. As this road will disappear under the foreshore developments, provision has had to be made for the diversion of the cables.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

The Case for Overhead Lines

FOR many years criticism has been levelled at overhead line transmission and distribution, the latest being that of the chairman of the Transmission Section of the I.E.E. Adjectives have been freely used by such organisations as the National Farmers' Union, town planning committees, the Society for the Preservation of Rural England, and others with very little electrical knowledge. Yet the world persists in erecting overhead lines and, were it not for them, this country would be by now in a very sorry state, probably ruled by Hitler's Gestapo, for we could not have equipped our wartime factories without this form of transmission.

In the early days of the grid we were saturated with destructive criticism, verbal and printed, most of which was rightly treated with amused contempt. One hears little from these critics now that the schemes have been abundantly justified.

The Commissioners' regulations have also been persistently attacked. One contributor recently advocated an alteration to these regulations to permit of special heavy construction for lines erected on high ground, and lighter construction for lower altitudes on account of increased ice and snow loading in the former case, forgetting that in this country frost and snow often lie thicker in the glen than on the hill and are generally worse in the west than in the east. Further, it frequently happens that wind pressure is greater in the valleys than on the higher plateaux. To legislate for all climatic conditions is obviously impracticable.

Experience has proved that the Commissioners' original regulations were framed by men with knowledge of all the circumstances, for the regulations have worked very satisfactorily in that excellent continuity of supply has been maintained throughout and the incalculable heavy consequential loss through frequent failure has been avoided. This despite the vagaries of weather and, so far, everything that the Luftwaffe has dropped on us. Any additional capital cost involved in consequence of these regulations has proved the cheapest and most satisfactory form of insurance for the nation.

The fact is that the patient, persistent and brilliant thought concentrated upon the design and layout of plant and equipment for generation and transmission of electricity, controlled as it is by the Commissioners' regulations, has unquestionably resulted in the electrical industry of Great Britain being very highly organised and efficient, providing a cheap, continuous and abundant supply for all essentials.

There has been no major interruption of electricity supply during the war; such interruptions as may have occurred have been minor in character and of short duration, therefore of little consequence. This satisfactory position is shared by underground and overhead systems alike, and is directly attributable to the Central Electricity Board's grid system, largely composed of overhead lines. Day in, day out, year by year, electricity has been available all the time. Complete perfection would be very boring ; so is persistent criticism. How surprised we should all be if, for once, someone in authority said " Well done, electricity supply!"

Caversham, Reading. N. D. WATSHAM.

Lighting and Fuel Economy

WHILE investigating privately the ways of obtaining fuel economy, I have been reminded, somewhat forcibly, that this economy may be obtained at a cost which will outweigh the small advantages gained. The letter from Mr. Pilkington in your issue of October 16th, is a cold consideration of statistics, and ignores the human aspect entirely.

The development of ornamental lighting fittings has been encouraged by the high intrinsic brilliance of the gas-filled lamp, which without any form of obscuration is disabling to vision because of the glare. This factor was recognised in the Fifth Report of the Home Office Committee, which placed restrictions on the installation of lamps at a height below 16 ft. from the ground unless they were covered with some material having a surface brightness of 10 (or less) candles per sq. in. if any light was subtended along angles above 70 deg. from the normal. The surface brightness of any pearl lamp far exceeds the 10 candles per sq. in. maximum, and the statement that these lamps do not cause injury to eyesight is misleading.

Generally, the modern house has ceilings at a height of 8 ft. 6 in. to 10 ft., and any bare gas-filled lamps at those heights will produce a considerable amount of discomfort, and if reading or other visually arduous tasks are carried out, the resultant damage to the eye can be considerable.

It is true that many ornamental lighting fittings absorb more light than is strictly necessary for diffusion, but the gloom and depression likely to be engendered if the suggestion of Mr. Pilkington is acted upon can far outweigh the value of the saving.

Cleanliness of fittings, walls and ceilings, and careful switching off when rooms are not in use are in my opinion safer methods of saving energy used for lighting.

To be logical Mr. Pilkington should advocate the scrapping of *all* general lighting schemes and the substitution of small-wattage local lamps for every task. The gloom that followed would be national.

In conclusion, is it not parodoxical to claim that pearling the bulb of a lamp entails no loss of light, and then state (accurately) that clear glass absorbs light?

Leeds. J. H. MOLLAN.

PERSONAL and SOCIAL

News of Men and Women of the Industry

HAMILTON Town Council has placed the burgh electrical engineer, **Mr. W. J. Cooper,** M.I.E.E., on the salary schedule for chief electrical engineers recently agreed to by the National Joint Committee of Local Authorities and Chief Electrical Engineers and has appointed **Mr. F. C. W. Clark,** A.M.I.E.E., deputy burgh electrical engineer on the grade 2 salary of the National Joint Board Schedule.

The marriage took place at Wollaton Church, Nottingham, on Wednesday of **Captain Benjamin Croft Bayley,** M.B.E., M.I.E.E., of Nottingham, and Aileen Beryl Bennett, of London. Capt. Bayley is electrical engineer to John Player & Sons, Nottingham, and was chairman of the East Midland Sub-Centre of the Institution of Electrical Engineers during the 1940-41 session.

Mr. A. Faul, West Hartlepool, has been appointed commercial assistant in the West Hartlepool Electricity Department at a salary of £350 per annum rising to £375.

The Swedish International Press Bureau reports the retirement of **Mr. Hans Holm,** head of the Swedish Ericsson Telephone Co.

Mr. W. E. Blackburn has resigned from the board of Vactric, Ltd.

Obituary

Mr. J. D. Coales.—We regret to record the sudden death on October 18th, while on duty in Glasgow of Mr. John Dennis Coales, D.Sc., F.R.M.S., M.I.E.E., of Berryfield, Cobham, Surrey. The funeral took place at Hatchford, Surrey, on Friday last.

Mr. Arthur William Adams, secretary-treasurer of the Brazilian Traction, Light & Power Co., Ltd., died in Toronto recently at the age of fifty-seven. He was director of the São Paulo Tramway Light & Power Co., Ltd., the São Paulo Electric Co., Ltd., the Brazilian Telephone Co., and the Brazilian Hydro-Electric Co., Ltd.

Mr. J. H. Cowell, aged eighty-four, who was transport manager to Blackburn Corporation for over thirty years and was engaged in public transport undertakings for sixty years, died on October 21st in a private nursing home. Starting his business career as a clerk with Bushby, Ltd., Liverpool, he became managing director of the old Blackburn & Darwen Tramway Co., and then took charge of Darwen Transport Department. He was appointed traffic manager at Blackburn in 1898 when the town acquired the transport service from a private concern, and electrified it, and after a period as joint manager he was given sole charge in 1906. Mr. Cowell retired in 1937.

Mr. H. Broadbent.—We regret to report the death of Mr. Horace Broadbent, chairman of Thomas Broadbent & Sons, Ltd., Huddersfield. Mr. Broadbent, who was 79, was a pioneer in the development of hydro-extractors and electric cranes, and the patentee of many revolutionary improvements in the design of centrifugal machinery. He had been chairman of the Huddersfield Engineering Employers' Federation and of the Huddersfield Engineering Society. He leaves a widow and two sons.

Major H. O. Wraith.—We regret to learn of the death of Major Herbert Osborn Wraith, M.I.E.E., lately of the Town Electrical Engineer's office, Bulawayo, Southern Rhodesia, which occurred on August 2nd.

Mr. J. S. Conover.—The death is reported from New York, at the age of seventy-eight, of Mr. John S. Conover who was with the American General Electric Co. until his retirement in 1931. Mr. Conover joined the Thomson-Houston International Electric Co. and represented that company in Europe for some years. He went to India in 1898 and was responsible for the Cauvery Falls transmission development, one of the first Indian hydro-electric schemes. He was with the British Thomson-Houston Co., Ltd., for about five years between 1902 and 1907.

Mr. J. E. Brown, who was general manager of the Ottawa Hydro-Electric Commission for some years, until his retirement in 1937, died at Ottawa recently. Mr. Brown, who was seventy-three years old, established the plant of the Standard Electric Co. in Ottawa fifty-two years ago.

Call-up of Young Men

THE Ministry of Labour and National Service has announced that in view of the urgent need for men in the Forces the Government has decided to bring to an end the deferments granted for men in certain occupations who were below the age of 25 when they registered under the National Service Acts, and in certain other occupations under the age of 30. As a preparatory step all the young men concerned will be summoned for medical examination almost immediately. Before any of them are called up, however, their employers will be given an opportunity of indicating for which men they need substitutes. Where it is agreed that a substitute is needed, the man concerned will not be called up until a substitute has been supplied.

Britain to America

Supply Industry's Great Work

MR. HAROLD HOBSON, general manager of the Central Electricity Board, gave a short talk on "Electricity Supply in Great Britain in Wartime" in the B.B.C. North American Service last Sunday night. In many of the broadcasts from this country to America it is customary for the speaker to address his remarks to an individual occupying a position in the United States similar to his own, and on this occasion Mr. Hobson spoke to Mr. John C. Parker, vice-president of the Consolidated Edison Company of New York.

In the course of his talk Mr. Hobson briefly reviewed the position of electricity service in this country after three years of war. He referred to the immense programme of munitions expansion which had involved not only extensions of existing factories but the construction of many large new works, the sites for which were chosen for strategic reasons and were often remote from existing load centres. In planning these new works, the Government looked to the public electricity service to meet all the new demands as soon as they arose. At the same time large transfers of population were taking place which brought about a fall in demands for electricity in certain parts of the country.

The task was not an easy one, but it had been done. It was indeed much greater than would appear from the bare figures recently published which showed an increase of nearly 33 per cent. in the kWh generated in 1941 as compared with 1938, an increase which was still continuing. In spite of the stringency of materials and manpower the electricity supply industry had stood the test and with very few exceptions the vast munition output of Great Britain depended upon the service.

The country had been fortunate in finding to its hand a fully integrated system of electricity production and main transmission which, although set up in peacetime primarily for reasons of economy, had proved of inestimable value in wartime. The long-term programme of generating plant expansion already in hand combined with the great flexibility of the system made it possible rapidly to deal with the ever-increasing demands, for power wherever they arose without seriously curtailing the standard of domestic service.

The grid had, moreover, provided a degree of security in war conditions which would have been quite unattainable without it. It was impossible to go through the sort of concentrated air attack which this country experienced in the winter of 1940-41 without some damage and interruption of supply, but by bringing in over the grid electricity from the pooled generating resources of the country, supplies had been got away again very much more quickly. A.R.P. measures taken before and early in the war, both by way of direct protection of plant and by way of pooled spare transformers, switchgear, and the like—measures, the cost of which had been shared between the supply industry and the Government—had played an essential part in this work. Restoration, in the vast majority of cases, had been a matter of hours only and in no case had it taken more than four days.

Such a record was not achieved by planning alone. Two other important factors had played their part. There had been a splendid spirit of co-operation between the many distributing authorities, both privately and publicly controlled, who had come to each other's assistance with men and materials. Above all, however, the whole personnel of the industry from top to bottom had given of their utmost wholeheartedly regardless of fatigue and often under conditions of grave danger.

New Zealand Earthquake

Electricity Authorities' Experiences

CONSIDERABLE damage to electricity systems in New Zealand was caused by a severe earthquake which occurred on June 24th, with its epicentre a few miles north-east of Masterton. Reports from the supply authorities concerned have been published in the *New Zealand Electrical Journal*; they show that there was widespread but not disastrous disruption of supply.

The Government system escaped with only minor troubles, due to precautions taken as a result of experience at the time of the Napier earthquake. Release clamps had been installed on the bushings of all main transformers to avoid overstressing, and these duly pulled off at the Melling and Masterton substations. At Marton oil and gas were expelled from an 11-kV oil circuit-breaker, causing a small fire and an explosion which partially wrecked the building.

At Manawatu Heads township in the area of the Horowhenua Electric Power Board a two-pole transformer substation was canted over to an angle of about 40 degrees and some poles were twisted round about 15 degrees in a clockwise direction although the normal pull on the wires is approximately equal (one wire on each side and one on the top pin).

The head office of the Tararua E.P.B. has been condemned on account of the damage done and there was extensive breakage of consumers' services, falling parapets carrying many away. Pole-mounted transformers lost a large quantity of oil and several sections of line were put out of commission owing to twists in almost every span for up to two or three miles. Mr. H. H. Elmes, secretary-manager of the Board, considers, as a result of his experience in this and a previous earthquake, that communication is the major problem. He suggests that each post office where there is a postmaster should be equipped with a small wireless transmitter and receiver to be used in such emergencies.

The greatest damage occurred in the area of the Wairarapa E.P.B. (which includes Master-

ton). All automatic switches on the main feeders tripped and the whole district was for a short time without a supply. A considerable quantity of oil was lost, two switches were burnt out and four tanks and one complete switch were thrown off their structures. Forty transformers were shifted and two were burnt out. Falling masonry, chimneys, etc., broke many services and in Queen Street, Masterton, about 90 per cent. of the main low-voltage and service lines on both sides of the street required renewing. Essential supplies were quickly restored and after ten hours electricity was available to all parts, although it was not until three days later that repairs were completed to the majority of installations to enable them to be reconnected.

The headworks at Kourarua had a severe shaking, several cracks appearing in the embankments and dams. Movement opened up the concrete of the surge tower so that water came pouring through. Although the movement at the lower power house was great enough to spill the oil out of the main bearings, the concrete building and the generating plant were undamaged.

Electricity Supply Questions

Views of the I.M.E.A.

LORD Justice Scott's Committee on Land Utilisation in Rural Areas devoted a section of its report to the reorganisation of electricity supply to enable electricity to be sold to rural consumers on the same terms as to those in towns. Evidence was received from the Electricity Commission and the Electrical Development Association.

It is maintained by the Joint Committee of Electricity Supply Associations that the Committee went beyond its terms of reference and, moreover, its recommendations do not truly reflect the views of the electricity supply industry. A minority report by Professor S. R. Dennison is said to represent the industry's views more accurately. The Joint Committee has expressed " profound concern " to the Ministry of Works and Planning at the Scott Committee's findings, stating that " the conclusions set out in the report are not according to facts and most certainly do not accord with the evidence given by the witnesses for the E.D.A."

The Incorporated Municipal Electrical Association has also considered the report separately and has addressed a letter to all Members of Parliament expressing the view that the Committee went beyond its terms of reference and stating that the Association, whose members are responsible for 60 per cent. of all the electricity supplied in the country, views with grave concern the statements of the Committee. The letter draws attention to the existence of the Joint Committee of Electricity Supply Associations which, it says is preparing a report for the " appropriate Ministry " on the subject of the reorganisation, including rural development.

Coal Prices and Quality

The I.M.E.A. has discussed with the Electricity Commissioners the question of the granting of a general authorisation for the increase of electricity charges to enable undertakings to reimburse themselves for the additional cost of fuel.

Various aspects of the increase in coal prices have also been considered by the Conjoint Committee of Public Utility Associations. Dissatisfaction has been expressed with the present price-fixing arrangements and it has been suggested that an independent tribunal should be set up to settle disputes on price, quality, etc. The Ministry of Fuel has rejected this proposal on the ground that such matters fall within the range of Government policy. It has been agreed to state a case for submission to the Minister.

The Conference holds the view that machinery should exist to enable consumers to be consulted before the creation of new district price schemes and that a committee should be appointed to advise the Minister on these questions from the consumers' point of view.

Cooker Design

Approval has been given by the I.M.E.A. Electrical Apparatus Committee to a memorandum prepared by Mr. F. W. Purse (London J.E.A.) and it has been recommended that the I.M.E.A. representatives on E.D.A. should press for the memorandum to be considered again by the E.D.A. Cooker Committee. The memorandum deals mainly with the high cost and subsequent maintenance costs of electric cookers and suggests that plans for the redesigning of cookers should be put in hand immediately for post-war production, in collaboration with E.R.A. and B.E.A.M.A.

Particular stress is laid on the advisability of securing the interchangeability of renewable parts, such as hotplates, oven elements and switches, and upon the advantages that would accrue to the industry generally by some measure of rationalisation in cooker design.

Contract Price Adjustments

Consideration has been given by the I.M.E.A./B.E.A.M.A. Joint Committee to the preparation of a price-adjustment formula applicable to annual or running contracts. It has been agreed to recommend members, in view of the difficulty of devising a formula for this type of contract, to use the standard formula for non-erection contracts suitably adapted to meet specific individual annual or period contracts.

Meter Allowances

In 1936 it was agreed with the Inland Revenue authorities that the wear and tear allowance in respect of meters should be 7½ per cent. plus the 10 per cent. authorised by the Finance Act, 1932. This was increased by a further 10 per cent. by the Finance Act, 1938, subject to review in 1943. The I.M.E.A. Council recommends that the existing rate of 9 per cent. should be continued.

New Centre

It is stated that steps are being taken to form the South-West England and South Wales Centre of the I.M.E.A. When this is done the Association will be represented in all parts of the country.

COMMERCE and INDUSTRY

Refrigerator Service. Supply Undertakings as "Contractors."

Gas and Electricity

THIS week's leading article results from the catching of a number of straws in the wind. The latest is a note which has appeared in a number of local papers, presumably based upon some matter circulated by the Ministry of Information. It says :—

> " Seventeen dinners for four people, cooked by gas, use about one fuel unit. Electric lighting, iron, vacuum cleaner and radio in a household of four people consume an average of 6 electric units per week in winter. A gas iron can be used for 100 hours before it consumes one fuel unit. A large electric fire burns up one electric unit in 20 minutes."

This confusion between fuel units and electric units is either deliberate or merely ignorant. In any event it is prejudicial to electricity as is the way of many " official " pronouncements.

Fuel Economy Aid

About a million copies have already been sold of a little leaflet produced by the Electrical Development Association, 2, Savoy Hill, W.C.2, for distribution to consumers. This shows, for the South of England, the " fuel targets " for various sizes of houses and families, with equivalents in electricity and electricity combined with coal or coke. On the other side is shown the way in which the permitted consumption can be allocated (to cooking, water heating, etc.) for the four quarters of the year.

The leaflets cost 4s. 6d. a thousand, and special versions for the Midlands and Northern Zones are being produced.

Control of Quality

The control of quality of production, which was the subject of a special joint meeting of the Institutions of Civil, Mechanical and Electrical Engineers in April, was discussed last week at a three-day conference organised by the Board of Education and held at the Northampton Polytechnic, London.

The conference was attended by 80 teachers from technical colleges and schools, and three sessions were held each day. The introductory address was given by Sir Frank Gill, K.C.M.G., O.B.E., and the lecturers and tutors were Dr. B. P. Dudding and Mr. W. J. Jennett (General Electric Co., Ltd.), Mr. F. B. Taylor (British Thomson-Houston Co., Ltd.), Mr. H. Rissik (Standard Telephones & Cables, Ltd.), Mr. H. H. Harrison (Ministry of Labour Staff College), and Mr. R. Royan (Creed & Co., Ltd.).

Salvage of Non-Ferrous Metals

Non-ferrous metals are urgently needed in war factories and shipbuilding yards and to speed up the supply as well as to save as much shipping space as possible the Ministry of Supply has issued an urgent appeal for all unwanted copper, zinc, lead, pewter, white-metal, brass, bronze and aluminium.

The electrical industry can do much to help in this campaign and is urged to search out all unwanted articles such as copper cable, electrical parts and fittings, sheathing, tube, wire, turnings; zinc sheet and turnings; lead-covered cable, pipe, sheet, plumbers' jointings; bronze bearings, bushes, cocks, crown wheels, couplings, unions, valves, junction boxes; brass pipe, sheet, tube, turnings; whitemetal anti-friction metal, solder waste; aluminium (and its alloys), pipe, sheet, tube, turnings. These can be disposed of either to a depot provided by the local authority or to a scrap metal merchant.

Maintenance of Domestic Refrigerators

An announcement issued on behalf of all members of the Domestic Electric Refrigeration Association states that due to circumstances beyond the manufacturers' control the normal servicing and repair arrangements cannot always be fully maintained under wartime conditions. The reasons are non-availability of the necessary replacement parts and the urgent calls that are made upon their skilled personnel for purposes more closely related to the war effort. Nevertheless, everything is being done to satisfy customers' needs as far as is reasonably possible in existing circumstances, and it is hoped that the public will bear with them in the difficulties that have to be met through the exigencies of the war. Further, where guarantees are still operative, users may be assured that the manufacturers are doing their utmost to implement them fully, but where they are prevented from doing so promptly, it is hoped that those concerned will appreciate that this is due entirely to war conditions.

The following are members of D.E.R.A: Frigidaire, Ltd.; General Electric Co., Ltd. (Coldair, Ltd.); H.M.V. Household Appliances; International Refrigerator Co., Ltd. (International General Electric Co. of New York, Ltd.); Kelvinator, Ltd.; Marco Refrigerators, Ltd.; and the Pressed Steel Co., Ltd.

Contracting Work by Undertakings

The Electricity Commissioners have issued a memorandum dealing with the position, under the Essential Work (Electrical Contracting Industry) Order, 1942, of electricity undertakings who carry out contracting work. Under the Order the Minister may schedule electrical contracting undertakings (as defined in the Order) in respect of specified classes or descriptions of persons employed therein ; and if an electricity supply undertaking maintains a branch or department wholly or mainly engaged on electrical contracting, that branch or department may also be scheduled, but only to the extent that it engages in electrical contracting for persons who are not authorised electricity undertakers.

It has been agreed that the Electricity Commissioners shall make the necessary recommendations to the Ministry of Labour in cases where it is considered or desired that the electrical contracting branch or department of an electricity supply undertaking should be scheduled for the purposes of the new Order.

The Ministry of Labour also proposes to review from the standpoint of the new Order the certificates already issued to electricity undertakers under the Essential Work (General Provisions) Order, 1942. Electricity undertakings with contracting branches or departments will be identified by means of lists to be supplied to the Ministry of Labour by either of the two sides of the electrical contracting industry. These lists will be considered by the Ministry in consultation with the Commissioners with a view to the amendment in appropriate cases of the certificates so as to exclude all persons for the time being wholly or mainly engaged in electrical contracting work within the meaning of the Essential Work (Electrical Contracting Industry) Order, 1942. The Commissioners propose to confer with the Electricity Supply Man Power Consultative Committee before making recommendations to the Ministry of Labour.

Women in Electricity Undertakings

The Ministry of Labour and National Service has notified the Electricity Commissioners that it has been found necessary to make some modifications in the existing arrangements for the withdrawal of women employed in public utility undertakings. The revised arrangements are as follows :—Manual and non-manual women workers other than ancillary workers will be treated as reserved ; ancillary workers who had attained the age of 26 on registration will not be withdrawn under present arrangements ; ancillary workers who had not attained the age of 26 at the date of registration, including those born in 1922 and 1923, will be liable to be withdrawn. The effect of these modifications is that arrangements for prior substitution in certain areas will cease to operate. On the other hand, certain ancillary workers between the ages of 26 and 30 at the date of registration will cease to be liable to be withdrawn for the present. Shorthand-typists are now regarded as ancillary workers and are liable to be withdrawn. Electricity undertakers will receive a communication from the Ministry of Labour and National Service notifying them of any women employees who become de-reserved under the new arrangements.

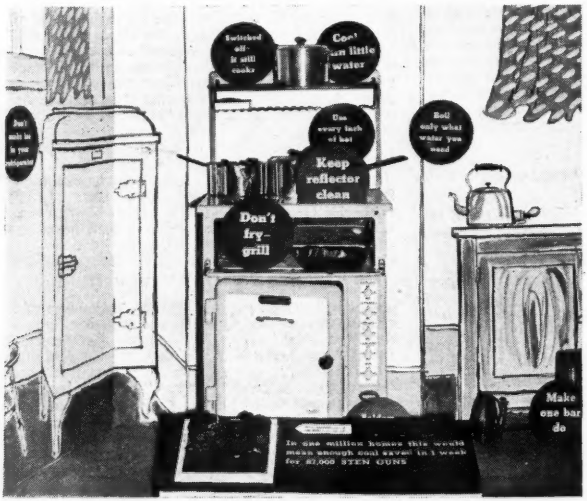
Flameproof Apparatus

The Mines Department of the Ministry of Fuel and Power has issued the quarterly list of electrical apparatus for which certificates of flameproof enclosure have been granted during the three months ended September 30th last. At the request of the British Electrical and Allied Manufacturers' Association a few copies of the list will, as usual, be on sale at the price of 1s. 2½d., post free, and may be obtained from the Library, Ministry of Fuel and Power, King's Buildings, Dean Stanley Street, S.W.1.

London Fuel Economy Exhibition

Fuel economy exhibitions have already been held in various parts of the country, but the "Battle for Fuel" Exhibition which was opened at Dorland Hall, Lower Regent Street, London, W,, on Wednesday of last week by Major Lloyd George, the Minister of Fuel, has been planned on a more ambitious scale. An impressive entrance to the exhibition has been constructed. This takes the form of a replica of a section of a coal mine, and to reach the exhibition visitors pass through a gallery from which can be seen full-sized models of miners at work with modern equipment.

The greater part of the exhibition is devoted to displays which show how to obtain economies by using household appliances to the best advantage, but the possibilities in industry have not been overlooked and a section of the exhibition illustrates how fuel economies can be made in industrial establishments. From the electrical point of view suggestions are made for economies in room warming, lighting and in the use of kitchen equipment, such as electric cookers, while industrial hints include the cleaning of lamps and fittings.


Switched off it still cooks
Can't run little water
Use every inch of hot
Keep reflector clean
Don't fry—grill
Boil only what water you need
Make one bar do
In one million homes this would mean enough coal saved in 1 week for 40,000 STEN GUNS

Part of the Dorland Hall Fuel Economy Exhibition

In opening the exhibition Major Lloyd George said that before the war London used to receive about 22 million tons of coal a year, or 10 per cent. of all the coal mined in Great Britain. The finest transport system in the world was not capable, even in peacetime, of meeting the city's needs without drawing on stocks which were

built up in the summer. The task of meeting London's needs this winter would be a heavy one and, in addition to the difficulties of distribution, there was a gap between production and consumption. He was satisfied that the gap could be bridged if all contributed their share. London could give a lead to the rest of the country in the economy campaign. Industry could make savings without imperilling the war effort, and domestic consumers could make economies without undue hardship.

The exhibition will continue until November 8th, after which it will commence a tour of the Provinces.

New Showroom at Nelson

Though the times are hardly propitious, Nelson Corporation officially opened its new electricity showroom on October 20th, when there was a wartime cookery demonstration in a large assembly hall. The Mayoress (Mrs. W. H. Hindle) performed the opening ceremony, and Alderman Winterbottom (chairman of the Electricity Committee) presided.

The "Smiths of Britain"

New displays on the front of the G.E.C. headquarters, Magnet House, Kingsway, London, W.C.2, epitomise strikingly and amusingly the work of the "Smiths of Britain," who represent the millions of munition workers, farmers and farm hands, those in essential commercial and administrative establishments, and in the Forces and the women's services, as well as the housewives of Britain. The displays are painted on wired glass which, in addition to being splinterproof, gives an almost three-dimensional effect. The well-known artist, Lupton, has achieved this by utilising both the front and back surfaces of the glass to obtain the required depth.

Fatalities

At Cupar (Fife) on October 20th, the Sheriff held an inquiry into the death of John Gardner (27), joiner, Anstruther, who had been employed to do odd jobs at a boat building yard. An apprentice shipwright, employed in the same yard, said in evidence that when handling an electric drill he received a slight shock and reported the matter to the foreman. Later he saw Gardner with the same drill on his way to the switchboard presumably to test it. Witness and two other men to whom he was talking then heard Gardner shout for someone to switch off. He was standing, drill in hand, apparently unable to let it go. Witness rushed across and switched off the power.

The foreman, giving evidence, stated that when it was reported to him that something was wrong with the drill, he instructed a qualified electrician to repair it. He saw Gardner in the yard with the drill in his hand. Gardner said there was nothing wrong with the machine, only the cable needed repair. The foreman told him to obtain new cable from the store and fix it to the drill.

Thomas Hunter, electrical engineer, Fife Electric Power Company, said that when he examined the drill, which operated at 250 V, after the accident, he found that the wires had been incorrectly connected allowing the current to flow direct to the body of any person holding the drill. This, in his opinion, was the cause of death. Medical evidence was to the effect that death was due to an electric shock. The Sheriff returned a formal verdict of "Accidental death."

A verdict of "Accidental death" was returned at an inquest at Newcastle on Mark Ball (40), of Blyth, a North-Eastern Electric Supply Co. linesman who received a fatal electric shock. It was stated that deceased, who was a capable man and knew more about the situation of the transmission masts than anyone else, received a work card instructing him to repair a mast, but in error he went to the wrong one, which had not been made "dead."

Electrical Commercial Travellers

The annual meeting of the Electrical Trades' Commercial Travellers' Association will be held on November 13th (at noon) at Clare House, Kingsway, London, W.C.2.

Change of Address

The London office of the Wandsworth Electrical Manufacturing Co., Ltd., has been removed to 308a, Station Road, Harrow (telephone : Harrow 0611).

Paper Economy Committee

The Minister of Production has appointed a Paper Economy Committee to assist him in obtaining a reduction in the consumption of paper. The Committee will examine all cases of excessive use of paper and take the necessary steps to effect economy. The Committee consists of Mr. L. W. Farrow, chartered accountant (chairman), Mr. H. C. Tingay, managing director, George Newnes, Ltd., and Mr. B. C. Westall, managing director, Thomas de la Rue & Co., and its address is 3, Central Buildings, Westminster, S.W.1.

Communications to the Committee will be welcomed, but in the interests of economy will not be acknowledged unless further information is required. The Committee is concerned with the economic use of paper and not with the collection of waste paper.

Insulating Paper Prices

The first schedule to the Control of Paper (No. 52) Order, 1942 (S.R.&O., 1942, No. 2,115, Stationery Office, 1s.), specifies new maximum prices for insulating cable papers of all qualities.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the following :—

Makers of special type of plug with split earth pin marked "HB. 327993."

Address of Beaton British Electric Manufacturing Co. (sausage machine makers).

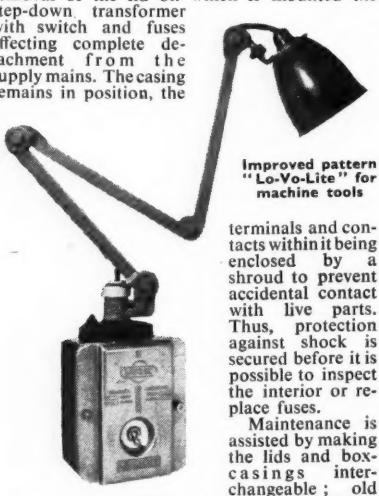
RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Low-voltage Lighting

A NEW model of the "Lo-Vo-Lite" outfit for the local illumination of machine tools in factories is announced by the IGRANIC ELECTRIC CO., LTD., Bedford.

The "self isolating" feature is retained, removal of the lid on which is mounted the step-down transformer with switch and fuses effecting complete detachment from the supply mains. The casing remains in position, the terminals and contacts within it being enclosed by a shroud to prevent accidental contact with live parts. Thus, protection against shock is secured before it is possible to inspect the interior or replace fuses.



Improved pattern "Lo-Vo-Lite" for machine tools

Maintenance is assisted by making the lids and box-casings interchangeable; old and new patterns will fit each other, so permitting an interior assembly to be replaced without interfering with the fixed casing carrying the adjustable lamp arm.

It is in constructional details that improvements have been made. The step-down transformer is of the "shell" type with primary and secondary coils wound concentrically on a single core to minimise magnetic flux leakage. Voltage regulation is well within B.S. 794 requirements, not rising sufficiently at low loads to impair lamp life. This feature is particularly beneficial when the 48-W transformer has to serve four 12-W lamps that may be individually switched, imposing a varying load intermittently.

The coils are layer wound, each layer being separated from adjacent ones by insulation, with an earthed shield between primary and secondary; the latter is also earthed according to B.S. 794. The whole transformer and lamination assembly is vacuum impregnated. Production is assisted by the standardisation of two primaries, each provided with three tappings for 210/230/250 V and 365/400/440 V respectively.

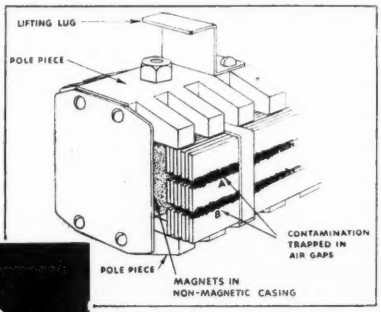
The replaceable glass tube cartridge fuses are of different sizes to prevent incorrect insertion. Their holders are positively clamped on the secondary side to prevent high resistance occurring, with conventional spring clips on the primary side forming part of the contact board, thereby avoiding a number of soldered joints. Each pole is fused on both sides.

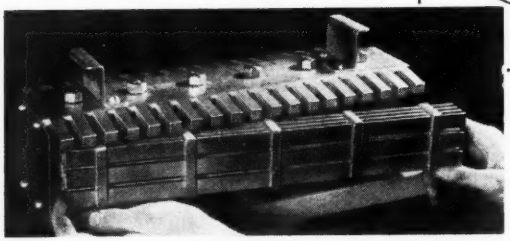
The latest design has 33 per cent. fewer parts than its predecessor, bakelite moulding and pressure die casting having effected material and assembly economies which enable the new model to be marketed at the same price as the 1940 type.

Magnetic Filters

The latest magnetic filter for use in settling tanks is a development of the original type intended to be fitted in pipe lines through which lubricants and cooling liquids circulate to machine tools and grinders, introduced by PHILIPS INDUSTRIAL (Philips Lamps, Ltd.), Century House, Shaftesbury Avenue, London, W.C.1.

The settling tank model is designed to incorporate three or six permanent magnets made of "Ticonal" 42/50 alloy, which has been chosen for its superior coercive force. The magnets are enclosed in a non-ferrous case and are connected in parallel by specially designed pole-pieces between which, on each side of the magnets, are two cages, the design of which is shown in the diagram. The spaces A and B constitute air gaps where ferrous contamination is trapped.





Magnetic filter for settling tanks of machine-tool lubricants

The normal method of fitting this filter is to place it in a wooden trough with 1½ to 2 in. clearance all round and to install it below the last of the settling tanks, so that the final operation in purifying the liquid is the removal of the very fine ferrous particles which are not trapped by the settling tanks. The Philips filter is not intended to replace the usual filtering methods, which adequately deal with the coarser contamination. When the filter is fully contaminated it is withdrawn from the trough. Each cage is then removed in turn and, as they are then non-magnetic, cleaning is a quick and simple matter, either by washing or by use of a compressed air jet.

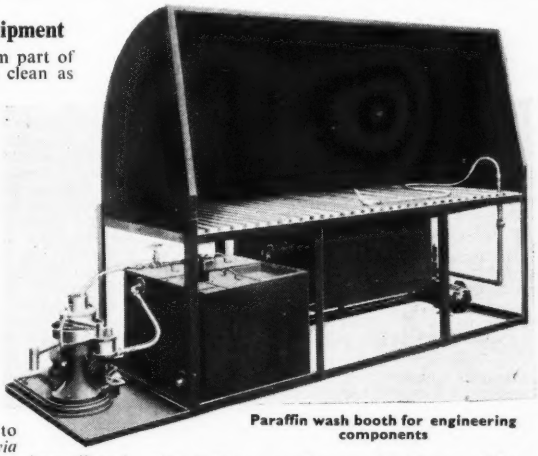
This filter is at present made in two sizes. The larger will trap between 2 and 3 lb. of fine ferrous contamination before it is advisable to clean it ; the smaller size has almost half this capacity.

Paraffin Wash Equipment

Components designed to form part of power units should be kept as clean as possible, for which purpose HOPKINSONS, LTD., Huddersfield, have developed paraffin wash booths.

These booths include a sump tank into which the oil and dirt from the washed parts fall. From the sump the oil overflows through a strainer into the dirty-oil collecting tank, fitted with a vertical centrifugal pump. The latter passes the oil to the Hopkinson separator in which all suspended dirt, small metal particles, water, etc., are continuously removed. Another pump returns the purified oil to a further tank from which a motorised high-pressure centrifugal pump takes the supply to the spray gun in the booth *via* special braided metal hose. The clean-oil and dirty-oil tanks have each a capacity of 30 gallons. The motors can be AC or DC.

The booths are also made in rectangular forms, with operating platforms of either perforated steel or hardwood slats. For washing engine blocks and other heavy units that are brought to the booth on roller conveyors the platform can also be formed of similar rollers, the work being passed into and away from the booth through sliding doors fitted in each end.



Paraffin wash booth for engineering components

A Plastic Torch

A novel type of switch action which is both simple and efficient is employed in a plastic torch case which the STORMLIGHT ELECTRICAL CO., LTD., 160–162, Mile End Road, London, E.1, is now producing.

The contact strip, which must touch the reflector to light the bulb, moves freely in between the coils of a spring, and when the battery is in position the pressure on the spring holds the strip firmly, thus preventing accidental contact.

Although the case is a little larger than the " No. 8 " type, the manufacture of which is now prohibited by the Board of Trade since the batteries required are considered uneconomical, it is not cumbersome and takes a standard " baby ' two-cell battery.

Cored Rubber

Articles formerly composed of moulded rubber are now being made of " Relt," which consists of a core of felt surrounded by a " corral " of rubber. It is a joint product of the EMPIRE RUBBER CO., Dunstable, Bedfordshire, in association with the Bury Felt Manufacturing Co. The saving of raw rubber amounts in some kinds of mouldings to as much as 75 per cent., while they may be from 30 to 75 per cent. lighter in weight. Another claim made for " Relt " is that variation of the degree of resilience is more easily accomplished than is the case with normal rubber mouldings, because the felt core is available in a range of different degrees of hardness. By its union with rubber it now becomes possible to employ felt for purposes for which it has not hitherto been used because of its absorbent nature.

Drying Surplus Garden Produce

DETAILS of a home-made electrically heated cabinet for drying surplus fruit and vegetables from the garden for use in the winter have been sent us by Mr. B. G. McLellan, Beverley House, Clifton, Yorks. The apparatus, which is easily and cheaply made, consists of a vertical cupboard about 1 ft. square, to suit the size of the electric heater available. Two upright posts, connected by six horizontal cross-bars, fix in the cardboard which forms the side wall to the posts. Sheets of cardboard, braced by wood laths, form the back and door. The side laths carry the drier trays, which are made of iron wire mesh and are also notched to take the rods made from electric conduit tubing.

The heater, which can be of almost any type and need be only quite small (½ kW is sufficient), is placed underneath.

ELECTRICITY SUPPLY

Blackburn's Economy. Douglas Engineer's Report.

Armadale.—INTERFERENCE WITH INSTALLATIONS.—The risk of fire through tenants of Council houses interfering with the electrical installations was emphasised at a recent meeting of the Town Council. It was stated that tenants were known to use their own flexes and in some cases telephone wire was being employed. Tenants were also running their own connections from the mains. It was agreed that the Council should prosecute when it was found that a tenant had interfered with the installation.

Blackburn.—REDUCED DOMESTIC CONSUMPTION.—Since the Fuel Economy Campaign started there has been a reduction of from 5 to 7 per cent. in the domestic consumption of electricity in Blackburn. Mr. R. H. Harral, the borough electrical engineer, in making this statement on October 24th, said that if industry economised to anything like the same extent the general position would be much easier. A fortnight's campaign to encourage fuel saving is being held in the town and on each day school children and housewives are being invited to the electricity showrooms to learn how economy can be effected. Most of the slogans exhibited in the showroom have been devised by the staff under Mr. J. D. Ashworth, consumers' engineer.

Darlington.—LOANS.—The Town Council is to apply for sanction to borrow £4,831 for the provision of e.h.v. feeder switchgear for the purpose of providing an additional electricity supply to an industrial consumer. It is also proposed to apply for loan sanction in respect of £339 for a feeder cable.

Douglas (I.O.M.).—ENGINEER'S REPORT.—Apart from Eire, the Isle of Man is the only place within these islands where the annual electricity supply reports are still published. It possesses two distribution authorities, the Board and Douglas Corporation. The whole of the power required is generated at the Corporation's power stations, and during the year ended March 31st last the total sales of 14·7 million kWh were divided nearly equally between the two authorities—7·4 million kWh for the Corporation's area and 7·3 million kWh in bulk supply to the Board. In 1940-41 sales amounted to 12·4 million kWh, the Board taking 5·5 million kWh.

In his report Mr. Bertram Kelly (borough electrical engineer and manager) shows that 18,612 tons of coal was used and the average price at the Pulrose elevators was £2 3s. 11d., compared with £1 18s. 8d. in the previous year, £1 10s. 5d. in 1939-40, £1 9s. 1d. in 1938-39 and £1 5s. 8d. in 1937-38. In common with most other supply authorities the Corporation has had to take a large proportion of fuel other than the kind for which the combustion equipment was designed, and although he believes that by comparison th~ Corporation has been more successful than others in dealing with this difficulty, it has involved a heavy strain, added cost and reduced efficiency.

The working cost (generation) per kWh sold last year was 0·94d., compared with 0·85d. in 1940-41, and an analysis shows that coal cost 0·70d. (0·63d.), salaries and wages 0·11d. (0·12d.) and repairs, maintenance, etc. 0·13d. (0·10d.). Total working costs per kWh sold amounted to 1·12d. (1·04d.) and overall costs averaged 1·55d. (1·44d.).

The average price obtained from the private supply rose from 2·32d. to 2·44d., while the price of the bulk supply to the Board decreased from 0·93d. to 0·92d., and the average price of the total supply fell from 1·71d. to 1·68d.

The maximum load on the generating stations during the year was 5,783 kW, that of the Board being 2,016 kW. The undertaking load factor improved from 32·26 to 35·27 per cent.

Fifty-two new consumers were connected during the year, the total number at the end of March being 6,466, whose average consumption for the twelve months was 1,144 kWh (compared with an average of 1,072 kWh per consumer in 1940-41). Per head of the population the private supply averaged 295 kWh (against 275 kWh). Appliances on hire at the end of the year numbered 3,179, an increase of 94.

The Electricity Department, in line with undertakings on the mainland, has participated in the Fuel Economy Campaign. The all-in tariff requires a minimum annual consumption of 550 kWh, but any consumer who through economy does not use this amount can transfer at the end of the quarter to the flat rates, under which there is now neither minimum charge nor minimum consumption.

The total income of the Department last year was £110,595 (against £95,718) and expenditure amounted to £73,463 (£58,817). The net profit of £10,752 (£15,948) has been transferred to the reserve fund, which now stands at £37,284.

London. — ADDITIONAL SUPPLY. — Hammersmith Executive Committee has approved of an additional supply of electricity being afforded to a commercial consumer within the borough. The cost (estimated at £260) of providing and laying the cable between the Council's substation and the new premises will be borne by the consumer, who will provide the additional switchgear required.

STANDBY SUPPLY.—Regarding the provision of a standby supply to one of the pumping stations of the Metropolitan Water Board, the Stoke Newington Emergency Committee reports that the scheme has now been approved by the Board. Arrangements have been made to purchase a disused e.h.v. cable from the Northmet Power Co. for £450, and the Committee has authorised the necessary repairs to be carried out to the cable, which was damaged by enemy action.

GENERATION A.R.P. COSTS AT HACKNEY.—The Stoke Newington Electricity Sub-committee reports that the borough treasurer has been in communication with the borough electrical engineer and borough treasurer of Hackney with regard to generation A.R.P. costs, and that all possible channels have been explored with a view to obtaining assistance towards this expenditure, but without success. The position, it is stated, appears to be that under the bulk supply agreement with the Hackney

Borough Council, Stoke Newington, need not pay anything toward these costs, but that in equity it is felt that they should contribute and the payment to Hackney of £1,195 has been authorised.

Millom.—HIGHER VOLTAGE. — On October 18th, the Rural District Council completed the change-over from 6,600 to 11,000 V, and a second high-voltage feeder was put into commission.

West Hartlepool.—TARIFF INCREASES.—The Corporation has made the following adjustments in its electricity tariffs :—A 15 per cent. wartime surcharge to be made on all flat rate and domestic rate accounts; an additional charge of 2d. to be made on weekly tariffs; and the granting of rebates to prepayment meter consumers to be discontinued.

Overseas

Balkans.—ELECTRIFICATION SCHEME.—It is reported from Sofia that the Cabinet has decided upon the scheme for the electrification of the whole of northern Bulgaria at a cost of 500 million levas. A power station is to be built at Pleven and four auxiliary stations at Kourilo, Mezdra, Chervenbeg and Pleven.

According to a *Reuter* message, quoting a Bucharest dispatch to the Vichy news agency, a large power station is to be built at the "Iron Gates" pass on the Danube. The station will supply electricity to the whole of Southern Rumania, Northern Bulgaria and certain districts of Serbia. It will be the largest of its kind in Europe, and the Rumanian railway system will be electrified when it is completed.

New Zealand.—INCREASED TRANSMISSION VOLTAGE.—The *New Zealand Electrical Journal* reports that an important step in the hydro-electric development of the South Island will be taken toward the end of this year when the high-voltage system between Timaru and Hororata will be changed over from 66,000 to 110,000 V. This will enable the Waitaki station to carry a much greater proportion of the Christchurch load than it now does, and will provide a valuable safeguard against interruptions in the supply to Christchurch in the event of any failure at Lake Coleridge. With this change-over the whole of the system from Hororata south to Gore would be operating at 110,000 V.

TRANSPORT

Blackpool. — TRAMWAY EXTENSION DISALLOWED.—Recently the Corporation made application for authority to extend the tram track along Squires Gate Lane and Stanley Road, but the Ministry of War Transport refused permission, not being satisfied that the need warrants this course at present.

Darlington. — NEW TROLLEY-BUSES. — The Ministry of War Transport has allocated four trolley-buses to the Town Council for delivery during the year commencing April 1st, 1943.

Nottingham.—TROLLEY-BUS EXTENSION INQUIRY.—A public inquiry was held by the North Midland Regional Transport Commissioner (Mr. J. H. Stirk) recently in connection with an application of the Corporation for powers to extend the trolley-bus route to Wollaton. The application was opposed by the Midland General Omnibus Co., Ltd., and the Trent Motor Traction Co., Ltd., whose buses serve the district and on behalf of whom it was stated that if the Minister of War Transport felt that the problem would be solved by a new trolley-bus service, the companies would be prepared to install it. The Corporation might erect the equipment and lease it to the companies.

Mr. Ben England, general manager, Nottingham City Transport, estimated that it would take 300 tons of coal a year to provide the service, and 30,000 bus-miles would be saved in a year to the present operators. The extension would cost £2,762 for equipment and overhead gear and £2,000 to provide electricity. The equipment necessary for the route was in stock, and it was estimated it would take two months to prepare the route, which was 1.3 miles long.

France.—"METRO" EXTENSIONS.—It was recently announced that the No. 5 line of the Metropolitan Railway will be extended from the Gare du Nord to Pantin and the No. 8 line from the Porte de Charenton to a station called Charenton Ecoles, with an intermediate station called Liberte.

Switzerland. — FURKA-OBERALP ELECTRIFICATION.—Conversion of a further section of railway to electric traction is reported in an article in *Modern Transport* describing the system formed by the independent Rhaetian, Bernina, Furka-Oberalp and Visp-Zermatt metre-gauge railways, which provide a long east-to-west link between the cantons of Grisons and Valais. The total distance between the towns of the Rhaetian Alps and Zermatt, near the Matterhorn, by this route is 133 miles.

Although the Rhaetian system and the Visp—Zermatt railway have been electrified for many years the Furka-Oberalp line has continued to be worked by steam traction so that the through trains, while beginning and ending their journeys behind electric locomotives, have made the central part of the cross-country journey under steam power. War conditions have made the position of the steam line in Switzerland one of increasing difficulty, and the electrification of the Furka-Oberalp railway, foreshadowed for some time, has now become a reality. It is equipped on the same system as its neighbour lines, to which the connecting Schöllenen railway, originally equipped on another system, has been converted. Electric traction on the Furka-Oberalp line between Brigue and Disentis began on July 1st of this year. At the same time, opportunity has been taken to render the Oberalp section usable at all times of the year, and extensive galleries and avalanche tunnels have been built. In the Furka Pass the line will be closed, as before, during the winter, and here the supports of the contact line have been made demountable, to be removed on the cessation of the seasonal train service.

For through passenger and goods trains, four-motor, four-axle electric locomotives have been built as well as electric motor coaches with two motors on each bogie. With these new motive power units the journey time between Brigue and Disentis has been reduced from 4 hr. 45 min. to 3 hr. 15 min. Locomotives and motor coaches are designed to attain a maximum speed of 37 MPH on adhesion lines and 18·6 MPH on the rack sections.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The Nigerian Electricity Supply Corporation, Ltd., held its annual meeting on October 21st, when Major E. Seaborn Marks (chairman and managing director), said that another satisfactory result was disclosed by the accounts under review and, judging by the operating results to date, the current year should be even better. The effect on Nigerian tin mining brought about by the abolition of restriction of output and the loss of the Malayan and Dutch East Indies tin fields was now being felt by them in the still increasing demand for power. The tin mines were substantially their only consumers. For the period under review 49·5 million kWh was sold, an increase of 24 per cent. over the previous year and nearly double the output for 1940.

He regarded the position with misgiving as he saw the mines working all out to increase production and as a consequence shortening their span of life. E.P.T. therefore placed a greater burden on industries such as theirs, having a wasting asset, and he thought that they should be so placed as to have a reasonable chance of paying off their capital and so avoid being left with an empty shell when their wasting asset, the mines they furnished with power, was exhausted.

Crabtree Electrical Industries, Ltd., reports that the trading profit of the operating company for the year ended July 31st was £225,726, as compared with £171,132 in the preceding year, and the net profit was £111,390 (against £72,792). The parent company is paying a final ordinary dividend of 5 per cent. and a cash bonus of 7½ per cent., making a total distribution for the year of 17½ per cent. (unchanged).

Aron Electricity Meter, Ltd. reports a profit for the year to March 31st, after provision for tax, of £28,854, as compared with £20,183 for the previous year. From this are deducted directors' remuneration, office expenses, staff pensions, and other charges, leaving a net profit of £15,358 (against £9,682). Reserve receives £5,000 and the dividend for the year is 10 per cent. (against 7½ per cent). The balance carried forward is £10,883 (against £8,122 brought in).

The Britannia Electric Lamp Works, Ltd., reports a net profit of £8,813 for 1941-42 (as compared with £12,706 in the preceding year) after providing for taxation. £2,500 is written off goodwill and patents and the dividend is maintained at 7 per cent., leaving £11,221 to be carried forward.

Murex, Ltd.—After providing for depreciation there was a trading profit of £598,707 for 1941-42 (against £556,947) and a net distributable profit of £203,694 (against £213,222). The ordinary dividend is maintained at 20 per cent., reserves receive £75,000 and £17,000 is appropriated against advances to a subsidiary.

Erinoid, Ltd., shows net profits of £28,526 in 1941-42, after providing £66,387 for taxation. In the previous year when only £19,338 was required for taxation the net profit was £42,457. A sum of £10,000 (against £20,000) is transferred to general reserve and the ordinary dividend is maintained at 10 per cent., leaving £8,374 to be carried forward.

Herbert Morris, Ltd., report a trading profit for the year to July 31st, of £127,944, as compared with £101,694 for 1940-41, to which is added dividends and fees (£432) and £64,703 brought in. From this are deducted board fees and depreciation and, as already announced, the final ordinary dividend is 15 per cent., again making 20 per cent., tax free, for the year. The balance carried forward is £66,711.

The Dubilier Condenser Co., Ltd., reports a net profit for the year to March 31st of £12,067, as compared with £12,430 for the previous year. The ordinary dividend for the year is maintained at 10 per cent., and £16,695 is carried forward (against £13,477 brought in).

Thomas W. Ward, Ltd., are paying a final dividend of 7½ per cent., again making 11¼ per cent. for the year. The profit (after meeting taxation and depreciation) was £134,884, against £143,221.

The British Electric Traction Co., Ltd., has declared the interim dividends on its preference and preferred ordinary stock and one of 15 per cent. (same) on its deferred ordinary stock.

The Southern Areas Electric Corporation announces that no interim dividend is to be paid. There was no interim payment last year ; the year's dividend was 5 per cent.

The Ever Ready Co. (Great Britain), Ltd., is paying an interim dividend of 15 per cent., as last year.

Marconi's Wireless Telegraph Co., Ltd., is repeating its interim dividend of 3½ per cent.

The Marconi International Marine Communication Co., Ltd., announces the payment of a 2½ per cent. interim dividend (same).

Strand Electric Holdings, Ltd., has declared a dividend of 7 per cent. for the past year, against 4 per cent. for 1940-41.

Babcock & Wilcox, Ltd., are maintaining their interim ordinary dividend at 4 per cent., actual, less tax.

The Calcutta Electric Supply Corporation, Ltd., has declared an interim ordinary dividend of 3 per cent., net (against 3½ per cent.).

Braithwaite & Co., Engineers, Ltd., have declared a final dividend of 3 per cent., making 5 per cent. for the year (same).

New Companies

Industrial Supplies Co. (Midland), Ltd.—Private company. Registered October 1st. Capital, £1,000. Objects: To carry on the business of agents and manufacturers' representatives for the sale or purchase of, and factors of and dealers in, engines, motors, dynamos, pumps, castings, tubing, boilers, machinery, tools, vehicles, engineering and

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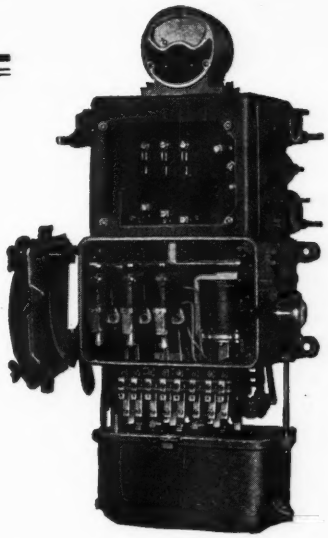

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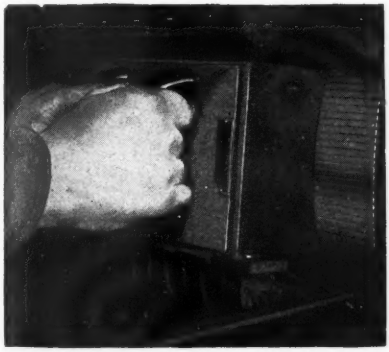

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Dolphin Engineering Co., Ltd.—Private company. Registered October 13th. Capital, £100. Objects: To carry on the business of electrical, lighting, heating, wireless, mechanical and general engineers, etc. Directors: Vivian G. Hines, St. Marys, Earls Colne, Essex, and Kathleen Graham.

Wilclean Engineering, Ltd.—Private company. Registered October 14th. Capital, £2,000. Objects: To carry on the business of manufacturers of, and wholesale and retail dealers in, washing and cleaning machines, radio instruments, electrical appliances, wringers, mangles, etc. Directors: H. Sunderland and G. M. L. Sunderland, both of 25, Lambourne Gardens, E.4, A. A. Saltmarsh, 22, St. Catherines Road, E.4, and G. A. Martin, 194, New Road, E.4. Registered office: 20, Wilmot Road, Leyton, E.10.

W. S. Henderson & Sons, Ltd.—Private company. Registered October 19th. Capital, £600. Objects: To acquire the business of an electrical engineer carried on by W. S. Henderson at 11a, Frederick Road, Salford, Lancs, as "E. Marsden & Co.," and to carry on the business of electrical, wireless, mechanical and general engineers, etc. The subscribers are:—W. S. Henderson, and Mrs. Edna Henderson, both of 204, Butterstile Lane, Prestwich, Manchester.

Companies Struck Off the Register

The names of the following companies have been struck off the Register and they are thereby dissolved:—Allsop Telephone Installing Co. Ltd.; Belmont Radio & Television, Ltd.; Bogota Telephone Co., Ltd.; Electrolines, Ltd.; Emerson Radio & Television Co., Ltd.; Silva Streem Radio Manufacturing Co., Ltd.

Companies' Returns

Statements of Capital

Johnson & Tanner, Ltd.—Capital, £2,500 in 1,000 preference shares of £1 and 30,000 ordinary shares of 1s. Return dated June 20th. 1,000 preference and 25,350 ordinary shares taken up. £1,267 10s. paid on 1,000 preference and 5,350 ordinary shares. £1,000 considered as as paid on 20,000 ordinary shares. Mortgages and charges: £453.

Tamplin & Makovski, Ltd.—Capital, £20,000 in 10s. shares. Return dated June 18th. 4,610 shares taken up. £250 paid on 500 shares. £2,055 considered as paid on 4,110 shares. Mortgages and charges: Nil.

Meteor Electric Lamp Co., Ltd.—Capital, £500 in £1 shares. Return dated June 4th. 100 shares taken up. £100 paid. Mortgages and charges: Nil.

British Electric Hydrators, Ltd.—Capital, £200 in £1 shares. Return dated December 4th, 1941 (filed June 5th, 1942). All shares taken up. £200 paid. Mortgages and charges: £1,100.

Mechanical & Electrical Industries, Ltd.—Capital, £1,000 in 1,000 shares of £1 each. Return dated June 30th (filed August 12th). 1,000 shares taken up. £1,000 paid. Mortgages and charges: Nil.

Premier Accumulator Co., Ltd.—Capital, £100 in £1 shares. Return dated August 19th. 2 shares taken up. £2 paid. Mortgages and charges: Nil.

Ewell Court Electrical, Ltd.—Capital, £2,000 in 2,000 shares of £1 each. Return dated June 16th. 1,510 shares taken up. £10 paid. £1,500 considered as paid. Mortgages and charges: Nil.

Bideford & District Electric Supply Co., Ltd.—Capital, £160,000 in £1 shares. Return dated June 12th. All shares taken up. £148,400 paid. £11,600 considered as paid. Mortgages and charges: Nil.

West Devon Electric Supply Co., Ltd.—Capital, £450,000 in £100,000 preference and £350,000 ordinary stock. Return dated June 12th. All stock taken up. £386,513 paid. £63,487 considered as paid. Mortgages and charges: Nil.

Merthyr Electric Traction & Lighting Co., Ltd.—Capital, £100,000 in 6,000 preference and 14,000 ordinary shares of £5. Return dated June 18th. 6,000 preference and 13,000 ordinary shares taken up. £95,000 paid. Mortgages and charges: Nil.

Hassocks & Hurst Electricity Co., Ltd.—Capital, £5,000 in £1 shares. Return dated June 25th. All shares taken up. £250 (1s. per share) paid. Mortgages and charges: Nil.

Second Electric Supply Corporation, Ltd.—Capital, £5,000 in £1 shares. Return dated June 25th. All shares taken up. £250 (1s. per share) paid. Mortgages and charges: Nil.

L. Weekes (Luton), Ltd.—Capital, £10,000 in £1 shares. Return dated June 11th. All shares taken up. £10,000 considered as paid. Mortgages and charges: Nil.

Mortgages and Charges

General Accessories Co., Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated September 23rd, 1942, to secure all moneys moneys due or to become due from the company to Barclays Bank, Ltd.

Satisfaction in full on September 23rd, 1942, of two debentures dated July 13th, 1934, and November 29th, 1940, and registered July 19th, 1934, and December 13th, 1940, respectively.

Underwood (Electric), Ltd.—Satisfaction in full on July 14th, 1942, of various charges dated April 16th, 1941, to July 2nd, 1942, and registered April 30th, 1941, to July 8th, 1942. (Notice filed September 24th, 1942.)

Liquidations

Northern Steel & Hardware Co., Ltd.—Winding up voluntarily. Liquidator, Mr. K. B. Hilton, 4, Clarence Street, Manchester, 2. Particulars of claims to the liquidator by November 23rd.

Bankruptcies

C. W. Sands, electrical and wireless contractor, High Street, King's Langley, Herts.—Supplemental dividend of 5d. in the £, payable October 30th, at 29, Russell Square, London, W.C.1.

STOCKS AND SHARES

TUESDAY EVENING.

THE tendency of Stock Exchange prices remains upward. One of the features at the present time is the attention that is being paid to Home Railway stocks. Another active part of the Stock Exchange is the market for foreign railway issues. Industrials hold their previous levels with unabated firmness; dividend announcements and dividend anticipations help to keep prices hard. Even when results may at first disappoint, the reaction is nearly always followed by recovery. The majority of changes in our price lists are again in favour of holders.

Home Railways Rise

The Home Railway market is amongst the most active at the moment. The junior stocks in particular have come in for unwonted attention. Amongst the stock to show gains are London Passenger Transport "C," which has gone up to 55 and Southern Railway 5 per cent. preferred which has risen to 76. The advance is 3 points in each case.

It has been mentioned on several occasions that the yield obtainable from London Passenger Transport "C" stock compares none too well with that afforded by junior stocks of the main lines. Reduction of the dividend to 2⅞ per cent. also contributed to the stock's unpopularity. Recently, however, a change of sentiment has become apparent. Although the return from Transport "C" at the present price is less than that obtainable from other similar issues, the argument runs that London Transport has greater scope for expansion in progress and revenue after the war than the main-line railways. Part, at any rate, of the recent buying would appear to have been on behalf of speculative investment which looks more to a chance of capital appreciation than to an immediate return upon the money invested.

Price Fluctuations

Mather & Platt are 1/16 up at 45s. British Insulated rose to 97s. Crabtree 10s. shares at 34s. have responded with a modest advance to the excellence of the figures published the other day. Ever-Ready are a little better at 34s. 6d. S. Smith 1s. shares are 1s. higher at 9s. 3d. and Tube Investments at 89s. have put on 6d. Thorn Electrics at 17s. 6d. gained the pence, and Pye deferred shares at 18s. are also 6d. up. English Electrics advanced 1s. at 43s. Movements in the Home electricity supply group are few, but upwards. Bournemouth & Poole at 51s. 6d., London Electrics at 24s. 6d. and Isle of Thanets at 13s. are all up 1s. and Midland Electric Powers are 6d. higher at 41s. 6d. Automatic Telephone "B" shares improved to 49s. 3d.

Cable & Wireless

Cable & Wireless 5½ per cent. preference is unchanged at 105½, but the ordinary at 69½ shows a rise of 1½. Reasons why the ordinary stock is expected to go better have been reflected here on several recent occasions. The prominence given to the junior stock has had the effect of thrusting the preference into the background. It will be noticed that the yield upon the latter stock is now about half-a-guinea per cent. less than that offered by the ordinary. Globe Telegraph and Trust ordinary have sympathised with Cable & Wireless ordinary by rising 1/6 to 31s. The 6 per cent. preferences, in scarce supply, remain at 28s. Oriental Telephones at 55s. 6d. are 1s. better at 55s. 9d. a price which still leaves a gap of three or four shillings between this market quotation and the estimated value of the share as measured by the company's holding of British Government stocks and other assets.

Canadian Utilities

During the past few days there has sprung up in the Stock Exchange market a considerable demand for dollar shares in some of the Canadian industrial undertakings. The principal feature amongst these is, for the moment, British Columbia Power "A" and "B" shares. The former at 34 have put on several dollars during the past business week, and the "B" shares strengthened to 4¼. The cause of the rises lies in the growing popularity of Canada as a hopeful financial hunting ground. Canada is attracting attention and capital: the utility companies are known to be doing well. Even Canadian Marconis are 9d. up. The war provides the principal motive power for the profitable progress the companies are now making, but it is argued that Canada will be, for several years to come, one of the main storehouses of the world's necessities in the shape of food and other commodities.

Dollar Stocks

Central and South American descriptions are in the limelight. Substantial rises have occurred in Argentine, Brazilian, Cuban and other railway stocks. War conditions are responsible for the present-day run upon issues that are, in certain cases, either little more than gambling counters, or very long lock-up speculations. To some extent, the stocks and shares in utility companies have been, and still are being, favourably affected. The recent rise in Brazilian Tractions has been carried no further, but the price retains its advance to 17⅜. Mexican Light & Power

(*Continued on page* 572)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend: Previous	Dividend: Last	Middle Price Oct. 27	Rise or Fall	Yield p.c.
Home Electricity Companies					£ s. d.
Bournemouth and Poole	12½	12½	51/6	+1/-	4 17 0
British Power and Light	6	6	27/-	..	4 9 0
City of London	7	7	27/-	..	5 3 8
Clyde Valley	8	8	40/-	..	4 0 0
County of London	8	8	38/-	+6d.	4 4 3
Edmundson's: 7% Pref.	7	7	34/-	+6d.	4 2 4
Ord.	6	6	28/-	..	4 5 9
Elec. Dis. Yorkshire	9	9	42/-	..	4 5 9
Elec. Fin. and Securities	12½	12½	49/-	..	5 2 1
Elec. Supply Corporation	10	10	44/-	..	4 11 0
Isle of Thanet	2	Nil	13/-	+1/-	—
Lancs. Light and Power	7½	7½	33/-	..	4 11 0
Llanelly Elec.	5½	5½	22/6	..	4 17 9
Lond. Assoc. Electric	4½	4	18/6	..	4 6 6
London Electric	6	6	24/6	+1/-	4 18 0
London Power Red. Deb.	5	5	104½	..	4 15 7
Metropolitan E.S.	8	8	37/-	..	4 6 6
Midland Counties	8	8	38/-	..	4 4 3
Mid. Elec. Power	9	9	41/6	+6d.	4 6 9
Newcastle Elec.	7	7	30/-	..	4 13 5
North Eastern Elec. Ordinary	7	7	30/6	..	4 11 10
7% Pref.	7	7	33/6	..	4 3 7
Northampton	10	10	46/-	..	4 7 0
Notting Hill 6% Pref. (£10)	6	Nil	8¼	..	—
Northmet Power: Ordinary	7	7	35/-	..	4 0 0
6% Pref.	6	6	30/-	..	4 0 0
Richmond Elec.	6	6	23/9	..	—
Scottish Power	8	8	38/-	..	4 4 3
Southern Areas	5	5	21/-	..	4 15 3
South London	7	7	24/6	..	—
West Devon	5	5	22/6	..	4 9 0
West Glos.	4½	3½	19/6	..	3 11 9
Yorkshire Elec.	8	8	40/-	..	4 0 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	4/3	..	—
Calcutta Elec.	7*	7*	27/6	−6d.	—
Cawnpore Elec.	10	10	26/-	..	7 13 10
East African Power	7	7	27/6	..	5 1 8
Jerusalem Elec.	7	5	20/6	+1/-	4 17 7
Kalgoorlie (10/-)	7½	5	7/6	+6d.	6 13 4
Madras Elec.	6*	4*	17/6	..	4 17 7
Montreal Power	1½	1½	24	..	6 5 0
Palestine Elec. "A"	Nil	4*	24/6	..	3 5 4
Perak Hydro-elec.	6	7	6/6	..	—
Shawinigan Power	83cts.	90cts.	15½	..	—
Tokyo Elec. 6%	6	6	14½	..	—
Victoria Falls Power	15	15	76/3	..	3 18 9
Whitehall Inv. Pref.	5	5	16/-	..	6 5 0

Company	Dividend: Previous	Dividend: Last	Middle Price Oct. 27	Rise or Fall	Yield p.c.
Public Boards					£ s. d.
Central Electricity: 1955–60	—	3	99	+⅜	3 0 7
1955–75	5	5	114	..	4 7 9
1951–73	4½	4½	107½	..	4 3 9
1963–93	3½	3½	103½	..	3 7 8
1974–94	3½	3½	99	..	3 5 4
London Elec. Trans. Ltd.	2½	2½	96	..	2 12 1
London & Home Counties 1955-75	4½	4½	109	..	4 2 7
Lond. Pass. Trans.: A	4½	4½	116½	..	3 17 3
B	5	5	116½	+1	4 5 10
C	3	2⅞	55	+3½	5 4 8
West Midlands J.E.A. 1948–68	5	5	108	..	4 12 7
Telegraph and Telephone					
Anglo-Am. Tel.: Pref.	6	6	109½xd	+1	5 9 7
Def.	1½	1½	26	..	5 15 5
Anglo-Portuguese	8	8	21/6	..	7 8 10
Cable & Wireless: 5½ Pref.	5½	5½	105½xd	..	5 4 3
Ord.	4	4	69½	+1½	5 16 0
Canadian Marconi $1	Nil	4cts.	6/-	+9d.	2 15 0
Globe Tel. & Tel.: Ord.	8¼*	5*	31/-	+1/6	3 4 6
Pref.	6	6	28/-	..	4 5 9
Great Northern Tel.: (£10)	Nil	Nil	18	..	—
Inter. Tel. & Tel.	Nil	Nil	4	..	—
Marconi-Marine	7½	7½	30/-	..	5 1 8
Oriental Tel. Ord.	16	10	55/6	+1/-	3 12 3
Telephone Props.	6	Nil	13/-	..	—
Tele. Rentals (5/-)	10	10	10/-	..	5 0 0
Traction and Transport					
Anglo Arg. Trans.: First Pref. (£5)	Nil	Nil	4/-	+1	—
4% Inc.	Nil	Nil	9½	..	—
Brit. Elec. Traction: Def. Ord.	45	45	975	..	4 14 0
Pref. Ord.	8	8	170	..	4 14 2
Bristol Trams	8	10	46/3	..	4 6 6
Brazil Traction	8½	$1	17⅞	..	—
Calcutta Trams	8	5½	19/-	..	5 15 9
Cape Elec. Trams	5	5	22/6	..	4 9 0
Lancs Transport	10	10	43/9	..	4 11 4
Mexican Light: 1st Bonds	5	5	92½	+2	5 8 1
Rio 5% Bonds	5	5	98½	..	5 1 6
Southern Rly.: 5% Prefd.	5	5	76	+3	6 11 7
5% Pref.	5	5	108	+½	4 12 7
T. Tilling	10	10	49/-	..	4 1 8
Tilling & B.A.	7*	6½*	57/6	..	2 5 3
West Riding	10	10	39/-	..	5 2 7

(Continued on next page)

* Dividends are paid free of Income Tax.

Company	Dividend Previous	Dividend Last	Middle Price Oct. 27	Rise or Fall	Yield p.c.
Equipment and Manufacturing			£ s. d.		
Aron Elec. Ord. ..	7½	10	32/– ..		6 5 0
Assoc. Elec. :					
Ord.	10	10	45/6	– 6d.	4 8 0
Pref.	8	8	39/– ..		4 2 0
Automatic Tel.&El.	12½	12½	52/6 ..		4 15 3
Babcock & Wilcox	11	11	47/–	–3d.	4 13 7
British Aluminium	10	10	48/3 ..		4 3 0
British Insul. Ord.	20	20	97/–	+6d.	4 2 6
British Thermostat (5/–)	18½	18½	16/3 ..		5 13 10
British Vac. Cleaner (5/–)	10	15	17/6 ..		4 5 9
Brush Ord. (5/–) ..	Nil	6	6/6 ..		4 12 4
Callender's ..	15	15	74/–xd..		4 1 1
ChlorideElec.Storage	15	15	75/– ..		4 0 0
Cole, E. K. (5/–) ..	Nil	7	13/6 ..		2 11 10
Consolidated Signal	17	17	81/3 ..		4 3 9
Crabtree (10/–) ..	17½	17½	34/–	+6d.	5 3 0
Crompton Parkinson Ord. (5/–) ..	30	20	24/– ..		4 3 4
E.M.I. (10/–) ..	Nil	6	16/3	–6d.	3 14 10
Elec. Construction	10	10	34/6 ..		5 16 0
Enfield Cable Ord.	12½	12½	54/6 ..		4 11 9
Elecl. Switchgear (10/–)	10	10	20/– ..		5 0 0
English Electric ..	10	10	43/–	+1/–	4 13 0
Ensign Lamps (5/–)	25	25	16/3 ..		7 13 10
Ericsson Tel. (5/–)	22*	20*	41/3 ..		2 8 6
Ever Ready (5/–)	40	40	34/6	+3d.	5 16 0
Falk Stadelmann	7½	7½	23/9 ..		6 6 4
Ferranti Pref. ..	7	7	27/– ..		5 3 8
G.E.C. :					
Pref.	6½	6½	33/9 ..		3 17 0
Ord.	20	17½	83/6 ..		4 3 9
Greenwood & Batley	15	15	34/6	+6d.	8 13 10
Hall Telephone(10/–)	10	12½	21/3 ..		5 17 8
Henley's (5/–) ..	20	20	23/3 ..		4 6 0
4½% Pref. ..	4½	4½	23/– ..		3 18 5
Hopkinsons ..	15	15	51/– ..		5 11 1
India Rubber Pref.	5½	5½	20/– ..		5 10 0
Intl. Combustion..	32½	30	112/6 ..		5 6 9
Johnson & Phillips	15	15	65/– ..		4 12 4
Lancashire Dynamo	20	20	73/9 ..		5 8 1
Laurence,Scott(5/–)	15	12½	10/– ..		6 5 6
London Elec. Wire	7½	7½	29/– ..		5 3 5
Lucas, J.	15	15	71/3 ..		4 4 4
Mather & Platt ..	10	10	45/–	+ 1/6	4 9 0
Met.Elec.Cable Pref.	5½	5½	21/3 ..		5 3 6
Murex	20	20	95/–	– 1/6	4 4 2
Pye Deferred (5/–)	25	25	18/–	+6d.	6 19 0
Revo (10/–) ..	20	17½	32/6 ..		5 7 8
Reyrolle	12½	12½	61/3 ..		4 1 7
Siemens Ord. ..	7½	7½	26/6 ..		5 13 3
Smith, S. (1/–) ..	50	37½	9/3	+1/–	4 1 1
Strand Elec. (5/–)	2	4	4/9 ..		4 4 3
Switchgear & Cowans (5/–) ..	15	10	10/– ..		5 0 0
T.C.C. (10/–) ..	5	5	15/– ..		3 6 8
T.C. & M... ..	10	10	44/6 ..		4 10 0
Telephone Mfg.(5/–)	9	9	10/3	+3d.	4 7 10
Thorn Elec. (5/–)..	20	20	17/6	+6d.	5 14 3
Tube Investments	23¾	20	89/–	+6d.	4 9 6
Vactric (5/–) ..	Nil	Nil	7/6	–1/–	––
Vickers (10/–) ..	10	10	18/3 ..		5 9 7
Ward & Goldstone (5/–)	20	20	20/– ..		5 0 0
Westinghouse Brake	10	10	51/3 ..		3 18 2
Walsall Conduits(4/–)	55	55	38/9 ..		5 13 4
West, Allen (5/–)..	7½	7½	5/9 ..		6 10 5

* Dividends are paid free of Income Tax.

Stocks & Shares (*Continued from page* 570)

bonds are better by 2½ points, and Mexico Trams have hardened to 4¼. Anglo-Argentine Tramways first preference are up 1s. at 4s. The income debenture shows no nominal change at 9½, but is being accumulated by speculators who like to get a lot of stock for a comparatively small outlay of cash.

Calcutta Electric

Calcutta Electric Supply Corporation has declared an interim dividend of 3 per cent. tax free, a reduction of 10s. per cent. as compared with a year ago. This was not wholly unexpected ; the price of the shares lost 6d. going back to 27s. 6d. In accordance with the usual practice when interim dividends are reduced, postponed or passed, the yield per cent. is removed from our price-columns and is replaced by a hyphen. Such reduction or postponement does not necessarily imply that the final dividend will fail to make up the dividend, for the full year, to the same as that in the previous twelve months. On the other hand, a doubt is naturally raised as what the year's dividend will prove to be, and to calculate a yield upon a basis of uncertainty might only mislead.

Nigerian Electric

The chairman of the Nigerian Electric Supply Corporation had somewhat trenchant remarks to make at the meeting last week in regard to the outlook for companies whose assets are of wasting character. He said that the best customers of the Nigerian Electricity Supply Corporation were the tin mines which, being alluvial, possessed assets that were entirely wasting. Every square yard worked meant a square yard gone for ever and, said the chairman, although prospects of the Nigerian companies for a few years implied prosperity while Malaya and the Dutch East Indies were rebuilding their industries, the life of Nigerian mines would be reduced and the electricity enterprise would suffer accordingly. In spite of the minor concession made to oil, mining and a few other companies, the E.P.T. burden presses with harshness upon many undertakings whose standard of profits falls with the period to which the tax is applicable.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1939

31074. "Electrical proportional control systems." Wallace & Tiernan Products, Inc. December 5th, 1938. (548171.)

1940

5728. "Electrical insulating compositions." Bakelite, Ltd. April 7th, 1939. (548220.)

7418. "Electrolytic cells." Wallace & Tiernan Products, Inc. August 18th, 1939. (548173.)

7419. "Preparation or maintenance of an electrolyte having a desired characteristic or characteristics, and apparatus for determining the composition or changes in composition of an electrolyte." Wallace & Tiernan Products, Inc. August 18th, 1939. (548174.)

10735. "Manufacture of tape-covered bundles of insulated wires." Bakelite, Ltd. June 28th, 1939. (548221.)

14254. "Generation of modulated high-frequency oscillations." G. Guanella. September 14th, 1939. (548191.)

14515. "Apparatus for the conversion or inversion of direct electric current to alternating current." Westinghouse Brake & Signal Co., Ltd., and A. H. B. Walker. September 24th, 1940. (548192.)

15626. "Granulating agent for use in preparing synthetic resins." British Thomson-Houston Co., Ltd. October 28th, 1939. (548242.)

17375. "Radiators and absorbers of electromagnetic waves." Standard Telephones & Cables, Ltd. December 9th, 1939. (548193.)

17923. "Sound reproducing and receiving devices." F. Harrison. December 20th, 1940. (548245.)

1941

933. "Miners' electric battery lamps." Koehler Manufacturing Co. January 23rd, 1940. (548223.)

1177. "Loudspeakers." Philco Radio & Television Corporation. January 29th, 1940. (548278.)

1296. "Apparatus for drilling diamonds and like purposes." General Electric Co., Ltd., and C. G. Eden. January 31st, 1941. (548246.)

2740. "Moisture and heat resisting varnish." H. R. Hampson and Metropolitan-Vickers Electrical Co., Ltd. February 28th, 1941. (548247.)

4065. "Bundling or gripping devices." Pyrotenax, Ltd., and J. G. Lewis. March 26th, 1941. (548179.)

4073. "Rotary compressors, turbines and the like." F. A. M. Heppner. March 26th, 1941. (548180.)

4089. "Direct-current electric motor control systems." General Electric Co., Ltd., and H. J. Coates. March 26th, 1941. (548226.)

4132. "Turbines." W. A. Bailey. March 27th, 1941. (548282.)

4174. "Cooling systems of electric machines." Brush Electrical Engineering Co., Ltd., and H. T. Price. March 28th, 1941. (548210.)

4291. "Submersible electric pumps." Sulzer Frères Soc. Anon. April 3rd, 1940. (548265.)

4309. "Apparatus for indicating electric currents." J. J. Dowling and Solus Teoranta. July 2nd, 1940. (548228.)

4312. "Frequency modulated oscillators." A. C. Cossor, Ltd., and D. A. Bell. March 31st, 1941. (548269.)

4329. "Aerial tuning systems." Marconi's Wireless Telegraph Co., Ltd. (Radio Corporation of America). April 1st, 1941. (548218.)

4473. "Unidirectional electrical inductive apparatus." British Thomson-Houston Co., Ltd. April 3rd, 1940. (548296.)

4616. "Electric flashlamps." British Thomson-Houston Co., Ltd. April 8th, 1940. (548297.)

7501. "Cathode-ray tubes." Standard Telephones & Cables, Ltd. June 25th, 1940. (548235.)

7695. "Apparatus and methods for limiting the duration of an electric current to a period of time not exceeding one-half cycle of an alternating current mains supply." Ferranti, Ltd., and L. Atkinson. June 18th, 1941. (548236.)

8261. "Thermally controlled electric switch devices." British Thomson-Houston Co., Ltd. July 5th, 1940. (548182.)

1942

4375. "Preparation or maintenance of an electrolyte having a desired characteristic or characteristics, and apparatus for determining the composition or changes in composition of an electrolyte." Wallace & Tiernan Products, Inc. August 18th, 1939. (Divided out of 548174.) (548186.)

6437. "Valve supports." British Thomson-Houston Co., Ltd. (General Electric Co.) May 12th, 1942. (548188.)

10485. "Charging apparatus for miners' lamps." Koehler Manufacturing Co. January 23rd, 1940. (Divided out of 548223.) (548241.)

10789. "Sound reproducing and receiving devices." F. Harrison. December 20th, 1940. (Divided out of 548245.) (548273.)

Copper Restrictions in Canada

DRASTIC curtailment of the use of copper or other non-ferrous metals for the extension of public utility services is announced by Mr. C. D. Howe, Canadian Minister of Munitions and Supply. A new Order prohibits any new installation of electric, gas, water, or telephone service in summer cottages and other seasonal residences, new installations of electric advertising or display signs or new lighting for city streets and highways. It also bans all public utility service extensions to refreshment booths, seasonal places of business, carnivals and other civilian places of entertainment and prohibits, except by permit, any new street railway lines or extensions to existing lines. House owners whose dwellings are more than 250 ft. from water and gas mains or power and telephone lines, are prevented from obtaining service connections without a permit.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Arklow.—November 2nd. Urban District Council. Electric lighting installations in 124 houses at Abbeylands. Specifications, etc., from P. J. Gregory Bannon, town clerk, Urban Council Offices.

Australia.—QUEENSLAND.—November 19th. 22-kV and 66-kV switchgear (Contract 42/J) and 1-kV and 6·6-kV lead-covered cable (Contract 42/K); A. E. Wilkinson, clerk, Barron Falls Hydro-electric Board, Cairns.

NEW SOUTH WALES.—Sydney County Council. November 26th. Current-limiting reactors for Bunnerong. Specification 594.

Manchester.—November 10th. Electricity Department. High-pressure steam pipework, valves, etc. for boilers. (See this issue.)

South Africa.—SALISBURY (S. RHODESIA).—November 30th. City Council. Cable and accessories. (See this issue.)

Orders Placed

Darlington.—Corporation. Accepted. Switchgear (£262).—Ferguson, Pailin.

London.—HAMMERSMITH.—Executive Committee. Accepted. E.h.v. switchgear (£714).—J. G. Statter & Co., Ltd. L.v. switchgear (£118).—Ferguson, Pailin, Ltd. Transformer (£221).—Bonar, Long & Co., Ltd.

STOKE NEWINGTON.—Electricity Sub-committee. Accepted. Repair of 72 old meters (£119).—Reason Manufacturing Co., Ltd.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Anglesey.—Dairy and creamery; A. Hewitt, architect, Town Hall, Llandudno.

Batley.—Testing room at Clerk Green Dairy; Batley Co-operative Society, Ltd.

Bredbury.—Bakery; W. Dobson Chapman, architect, Pear Tree House, Jordangate, Macclesfield.

Brighouse.—Two wartime nurseries at Holme House, Lightcliffe, and Ogden Lane, Rastrick; J. B. Brooke & Sons, Ltd., builders, 264, Manchester Road.

Castle Donington.—Fire station building; F. Ward, surveyor, Council Offices, Castle Hill, Castle Donington, Derby.

Cheshire.—Rescue party depot and garage, Rook Street, Crewe, for County Council; E. M. Parkes, county architect, The Castle, Chester.

Coventry.—Improvements, mortuary and refrigerating plant at Exhall Institution (£4,800); D. E. E. Gibson, city architect, 1a, Warwick Row.

Keighley.—Works canteen, Strong Close; J. Haggas & Sons, architects, 71, North Street.

London. — HAMMERSMITH. — Additional nurseries, White City estate and Dalling Road; borough engineer, Town Hall, W.6.

Manchester.—Fire station, Wythenshawe, and control centre, Booth Hall, Blackley; G. Noel Hill, city architect, Town Hall, Albert Square, Manchester, 2.

Branch library, Cheetham; city architect.

Housing schemes; J. Hughes, housing director, Town Hall.

Fire station, first-aid room, etc.; Manchester Oxide Co., Manox Works, Canal Street.

Surgical goods factory; J. Macdonald, Dawson Street, Greengate, Salford, 3.

Additions to factory; McCutcheon & Walsingham, 1180, Chester Road, Stretford.

Additions to factory; J. E. Kewell, architect, 7, Market Street, Altrincham.

Development of Denmark Road Market; S. Moss, 13, Portland Road, Eccles.

Newcastle-under-Lyme.—British Restaurant at Wolstanton (£1,530); J. Jones (N. S.), Ltd., Liverpool Road.

Orpington.—Additions and alterations at Orpington and Biggin Hill, for fire service accommodation; engineer, 46, Bark Hart Road.

Poole.—Control room at fire station; J. R. Barron, borough engineer, Municipal Buildings, Park Gates East.

Potters Bar.—Additions and alterations to civil defence buildings for U.D.C.; engineer, Wyllyotts Manor.

Preston.—Houses; J. E. Foster, borough surveyor, Town Hall.

Rotherham.—Works offices, Greasbrough Street; Rotherham Forge and Rolling Mills Co., Ltd.

Houses (870); V. Turner, Town Hall.

Stockport.—Works offices, Adswood Road; Boltons, Superheaters and Pipework Co., Ltd., Adswood.

Foundry, Stewart Street; H. Hollingdrake & Sons, Ltd., 63, Princes Street.

Stockton-on-Tees.—Adaptation of premises as wartime nurseries (£850); borough engineer.

Central kitchen; borough engineer.

Wakefield.—Second British Restaurant, Wesley Street; S. G. Wardley, city architect, Town Hall.

Warrington.—Branch Co-operative Stores, Gough Street; Warrington Co-operative Society, Ltd., Sankey Street.

Warwickshire.—Remand home at Knowle; A. C. Bunch, county architect, Shirehall, Warwick.

West Hartlepool.—Wartime nursery, Burn Valley Playground; borough engineer.

COMSOL

A Soft Silver Solder that economises tin

Originally favoured for the soldering of armature end windings to commutator segments in electric motors, this silver/lead alloy has recently achieved widespread popularity as a substitute for solders of high tin content now in short supply.

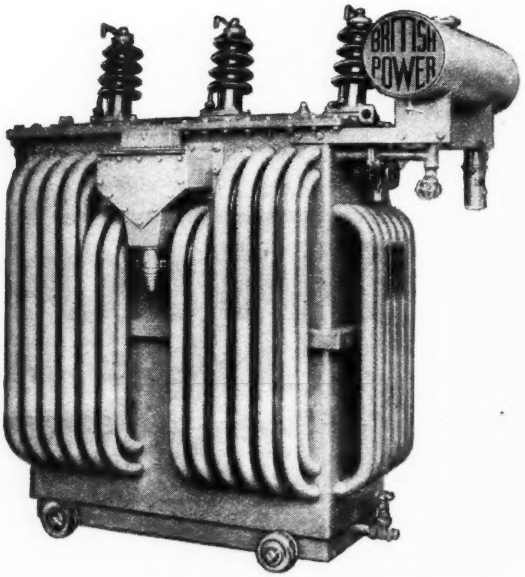
Fuller details of Comsol, which melts at 296°C., are contained in pamphlet No. 121, a copy of which will be sent free on request.

JOHNSON, MATTHEY & CO. LIMITED
73/83 HATTON GARDEN, LONDON, E.C.1
71/73 VITTORIA STREET, BIRMINGHAM 1
Oakes, Turner & Co., Ltd., 78/79 Eyre Street, Sheffield 1

"For the sake of appearances"

A common enough saying which implies that appearance does count. After all if you can't make a good job of the outside what are the hidden parts going to be like?

We rather pride ourselves on the appearance of our transformers, not only in the finish, but also as regards the proportions. A well-proportioned design is likely to be a sound one. We are always ready to remove the tank cover and to lift the core and windings to show that the inside is just as good as the outside.



300 KVA. 22000/2200 Volt transformer for use in a lightning area. Co-ordinated design having High Voltage bushings fitted with arcing gaps to protect the windings against lightning surges.

BRITISH POWER TRANSFORMER CO.

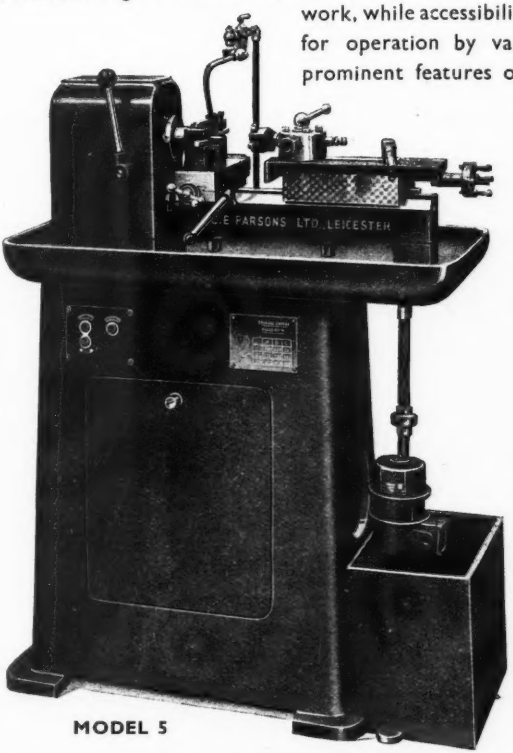
Phone: Howard 1492 LIMITED Grams: "Vitohm, Enfield"

QUEENSWAY, PONDERS END, MIDDX. T4

The PARSONS PRECISION CAPSTAN LATHE

Designed to meet the need for an accurate general utility machine for small repetition and second-operation work, the PARSONS CAPSTAN LATHE has, over a period of years, satisfied every demand made upon it.

Particular regard has been paid to ease of control and speedy setting up for work, while accessibility for servicing and suitability for operation by varied classes of labour are prominent features of the machine.



MODEL 5

PRINCIPAL DIMENSIONS :

Height of centres	4"
Swing over bed (clearance)	7⅞"
Swing over parting off slide	5¼"
Spindle bored dia.	9/16"
Bar capacity, Brass, Alum. dia.	½"
,, Steel dia.	7/16"
Turret slide, 4 holes dia.	¾"
Working stroke max.	3"
Length of bed from collet nose	21¼"
Collet nose to turret face, max.	12¼"
Floor space	36" × 20"
Height overall	47"
,, to centre of spindle	42"

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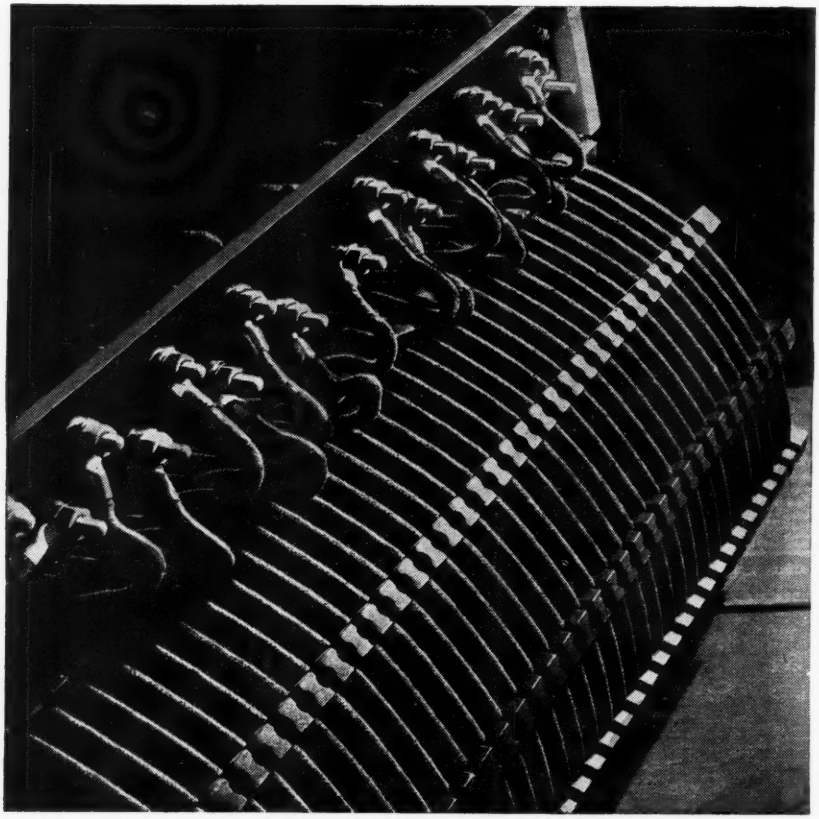
C. E. PARSONS LTD.

Telephone : LEICESTER 5695-6

PREMIER WORKS · WOODGATE · LEICESTER

It was just a coil of wire...



. . . now it is an inductance coil which has to meet the stern demands of a communication system that goes on day and night. One more example of Rediffusion products used in Rediffusion communication equipment.

REDIFFUSION LIMITED

A subsidiary of
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DESIGNERS AND MANUFACTURERS OF COMMUNICATION EQUIPMENT

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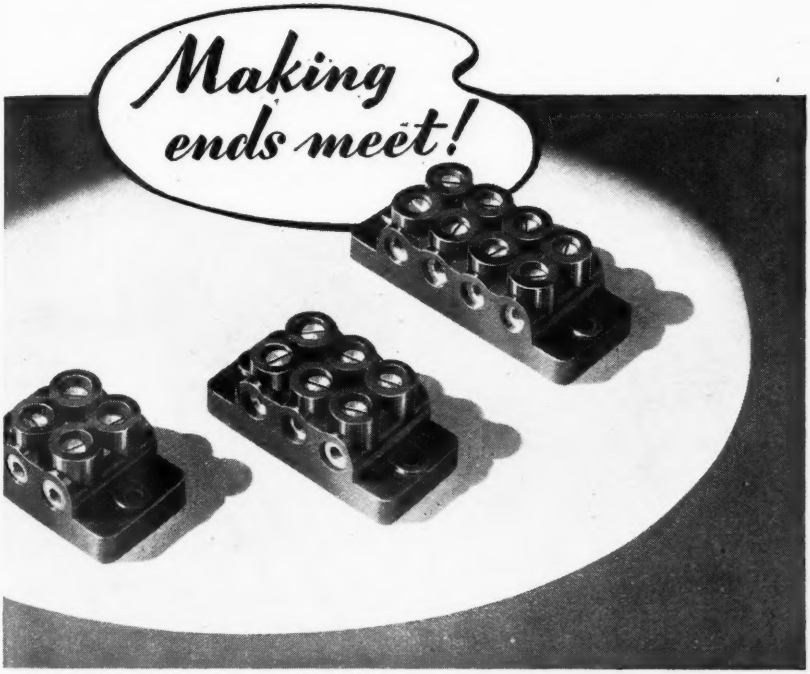

We have a wide range of Standard 2, 3, and 4 Way Terminal Blocks to meet the requirements of manufacturers of electrical equipment. We have designed and produced many mouldings for the Electrical Trade, and these are some of the few which we can still manufacture for present-day needs. However, we look forward to the time when we shall be solving your post-war problems, assisted by the extensive knowledge we are gaining in manufacturing to exacting war-time specifications.

INSULATORS LTD

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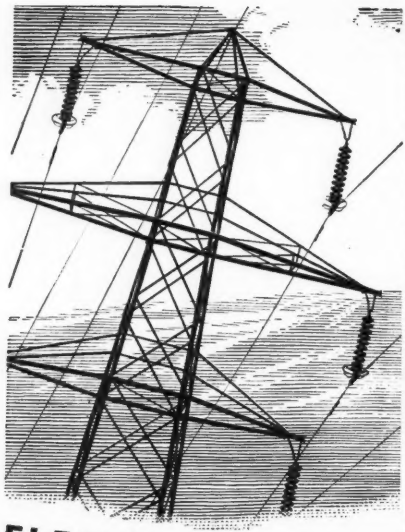
LEOPOLD ROAD · EDMONTON · LONDON · N18 · PHONE: TOT 1491 (4 lines)



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a mark of progress . . .

The up-to-date switch must work silently, with precision . . . . must not become oxydised or dirty . . . . must be able to stand momentary excessive overloads without being affected . . . . must never need to be overhauled or serviced. And the answer is, of course, the Sordoviso switch.

This switch is unique in design, featuring as it does :

- a minimum of movable parts which are enclosed in inert atmosphere.
- non-tilting mercury contacts.
- the construction of the complete apparatus in only three parts : glass switch in protective casing, solenoid, and outer case.

The trouble-free efficiency of the Sordoviso switch and its novel but essentially *practical* design make it adaptable to a large number of uses—Relay Units, Contactors, Remote-Control Units, Time-Lag Switches, Latched-in Relays . . . .

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REGISTERED TRADE MARK

SORDOVISO SWITCHGEAR LTD.
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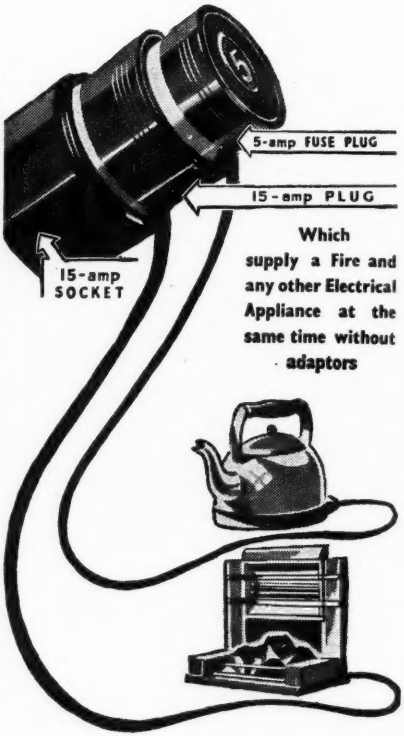
This is the System that Wylex Built



Which supply a Fire and any other Electrical Appliance at the same time without adaptors

Can only be done with the Flat Pin Wylex Fuse Plug System.

WYLEX

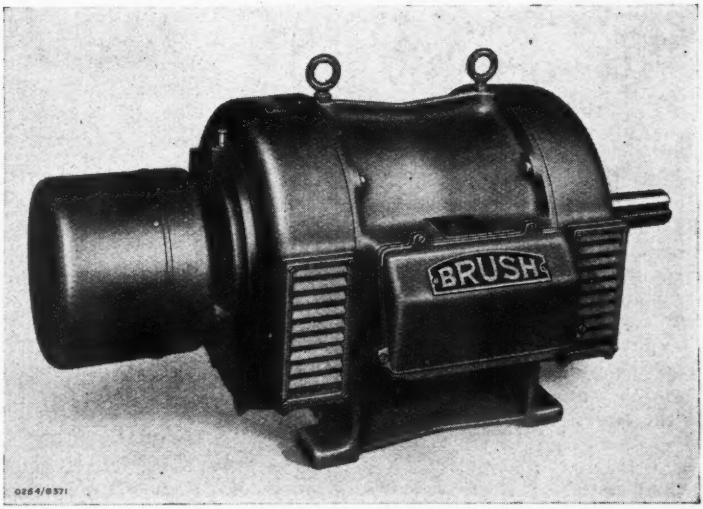
MILLIONS IN USE

GEORGE H. SCHOLES & Co. Ltd.
Wylex Works, Wythenshawe, MANCHESTER.

N2

BRUSH INDUCTION MOTORS

SQUIRREL CAGE & SLIPRING PATTERNS



FROM ¼ B.H.P. TO 1,500 B.H.P.

These motors comply in all respects with appropriate British Standard Specification.

Further details on application

Send us your enquiries

THE BRUSH ELECTRICAL ENGINEERING CO. LTD. LOUGHBOROUGH ENGLAND

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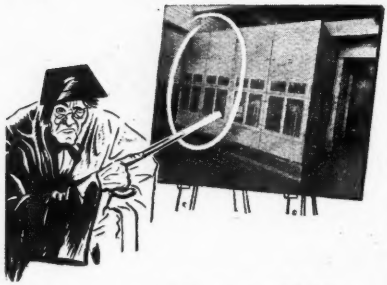

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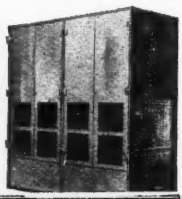
Sir—please sir! the **unit of simplicity** is the **Hewittic Rectifier.** It is the simplest of all rectifier units and being the simplest, is the most reliable. Also, being a **unit** conveniently shaped and handled, it can be formed into a compact bank with other Hewittic units to give any desired capacity and to fit into existing buildings and awkward sites.

And once installed, Sir, it simply carries on, **unattended,** even with the largest installations.

Very good answer 10/10

★ *The ideal converting plant for unattended substations.*



Hewittic Rectifiers

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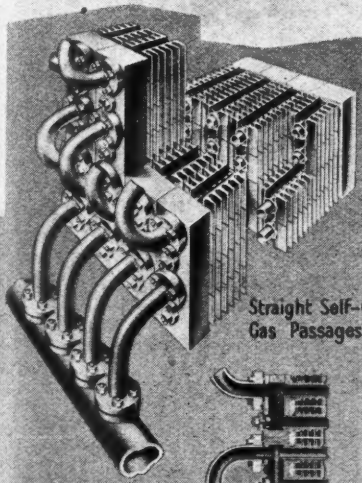

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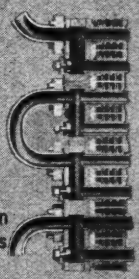

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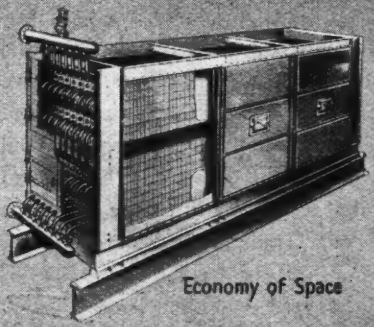

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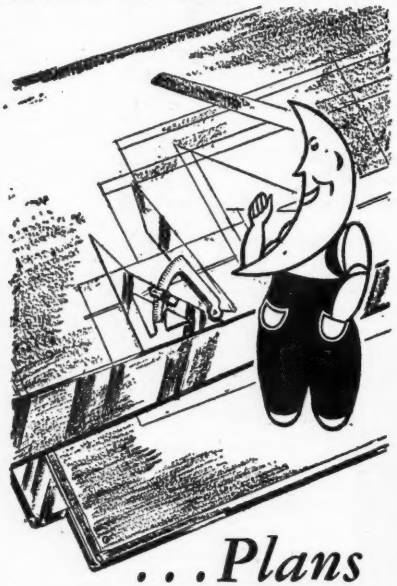

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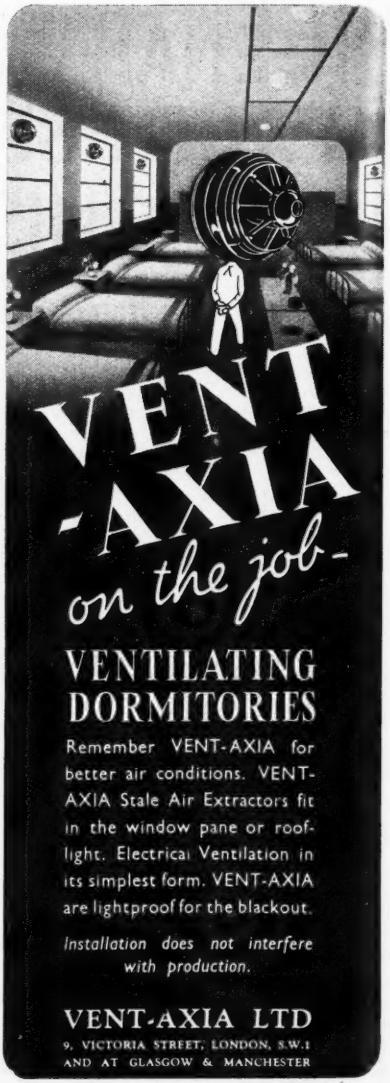

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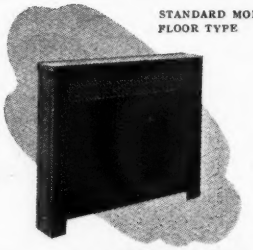

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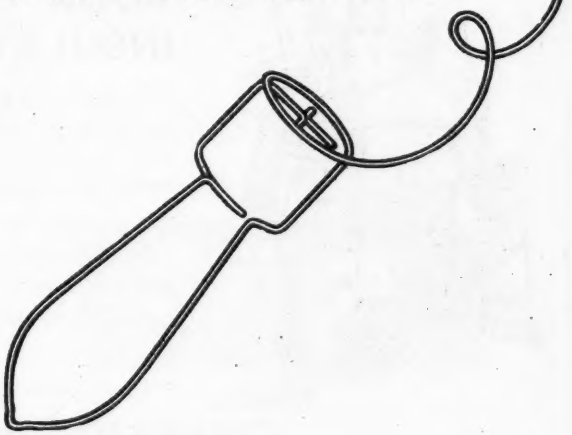

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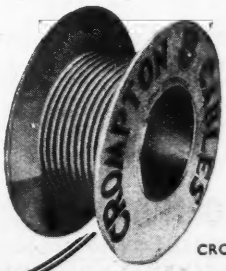

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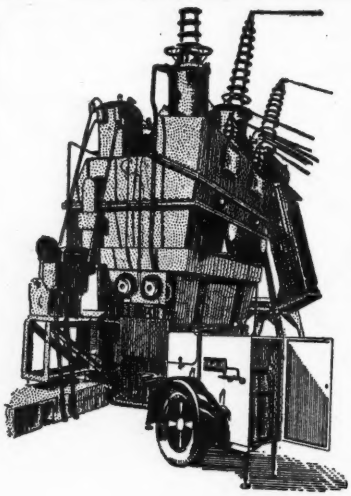

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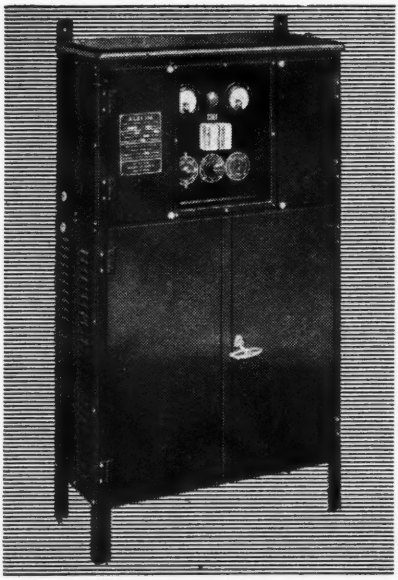

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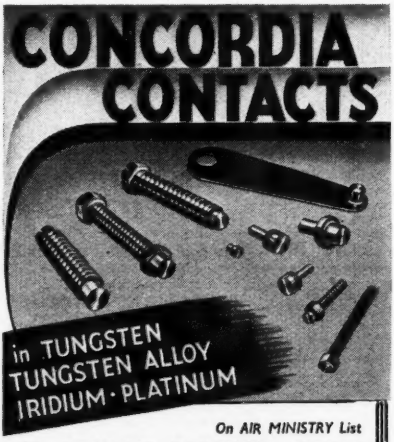

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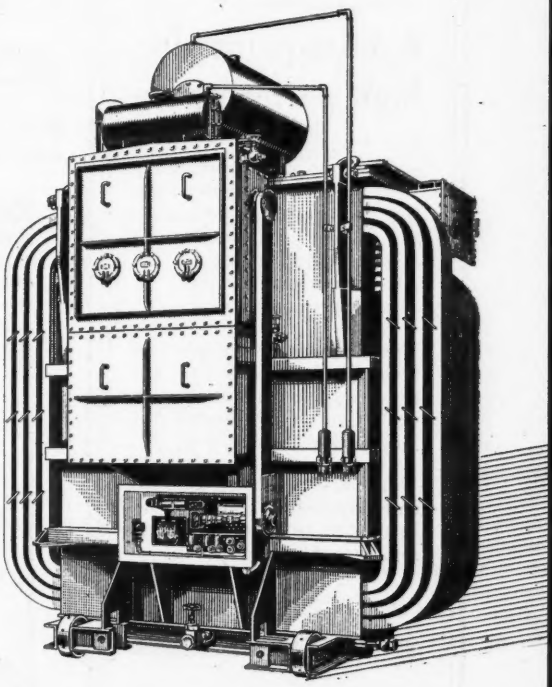

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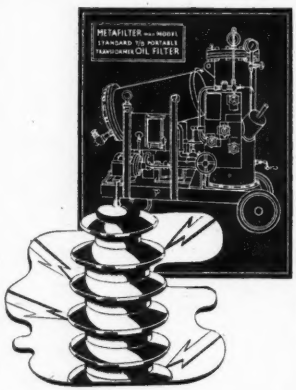

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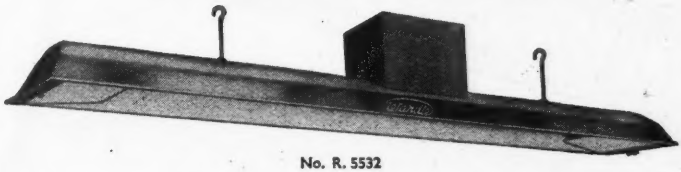

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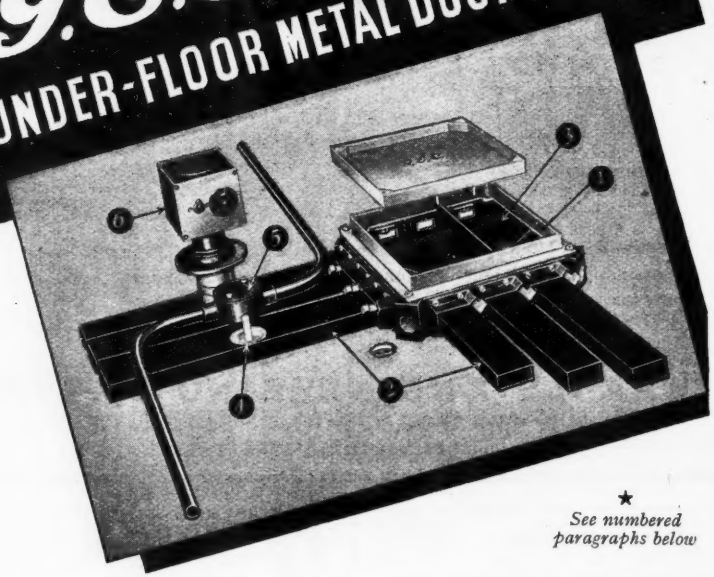

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